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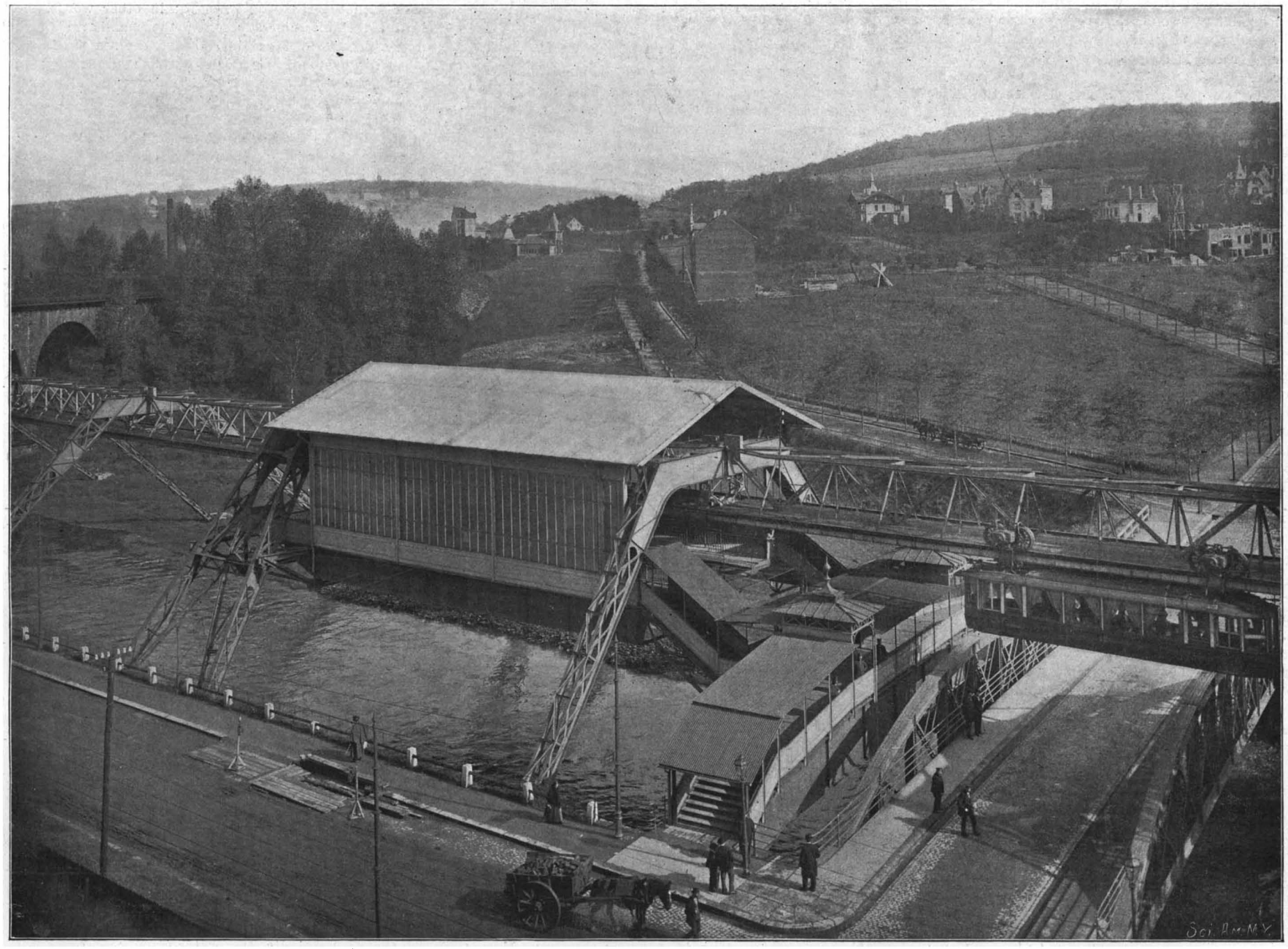
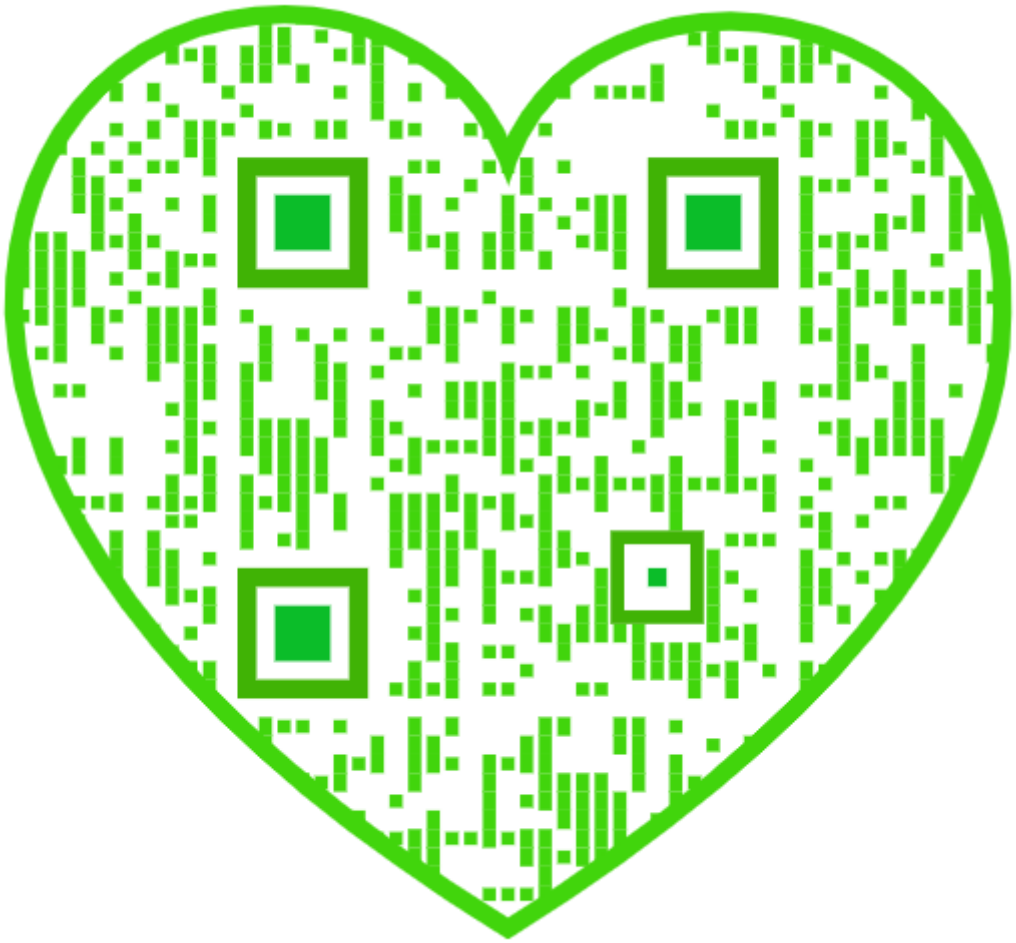
Interior of Doppersberg Station.

The Highway in Elberfeld Sonnborn, Showing the Inverted U-Frames.



General View of the Zoologischer Garten Station, Showing the Construction Over the Wupper River.

THE LANGEN SUSPENDED RAILWAY OF BARMEN-ELBERFELD-VOHWINKEL.—[See page 53.]



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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JANUARY 25, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE WRECKED NEW HAVEN CAR IN THE TUNNEL ACCIDENT.

In the thorough discussion of the recent New York Central tunnel accident which is now taking place, there is one most important point which is apparently being overlooked. On the evening of the day of the accident, outgoing passengers through the New York Central yards were attracted by a bonfire which was blazing fiercely on one of the side tracks. The material of this bonfire was the wrecked passenger coach in which seventeen lives had been lost a few hours before. Employés of the railroad were attending the car and seeing to it that every vestige of the woodwork was destroyed. We consider that in view of the enormous value of every scrap of material evidence that might throw light on this calamity, and enable the Coroner's jury and all subsequent investigating bodies to learn the true lessons of the disaster, it is extremely regretable, to say the least, that the company should have deliberately wiped out of existence this car, with the technical evidence that it would have afforded. There were two elements that contributed immediately to the magnitude of the disaster. One, the speed and momentum of the New York Central train; the other, the strength of the New Haven car, and its greater or less ability to offer that resistance to crushing and telescoping which every properly constructed, modern passenger car is supposed to possess in a very large degree.

One of the first things observed when the New York Central engine was backed out of the wrecked car of the New Haven train was the curious fact that the extension smokebox of the locomotive, whose front door had been burst in, was filled full of a substance that looked very much like sawdust. Where did this pulverized wood come from? When the engine drove its cowcatcher under the rear of the New Haven coach, its first action must have been to lift the floor of the coach until the floor and frame of the coach were level with the saddle and smokebox of the engine. The center longitudinal sills were probably struck by the unyielding saddle and tube-plate of the boiler. Had these car sills formed a portion of the thoroughly braced and tie-bolted under-frame of a modern car, they would have shown sufficient strength, one would have thought, to transmit the shock of the colliding engine throughout the whole length of the train. Apparently the shock transmitted was so out of all proportion as to suggest that the car platform crumpled up before the engine like the proverbial eggshell. Was the disintegrated wood that filled the smokebox of the engine and was scattered over the front platform sawdust that had been used as a sound-deadener in the floor, or was it the wreck of the framework? If the latter, and the car timbers were sound, a carbuilder would have looked to find splintered instead of pulverized wreckage. It is an interesting point well worthy of investigation.

Just now, a few specimens cut out of these sills and put through a testing machine to determine their quality might have an extremely important bearing in the present investigation. Possibly the railroad companies were careful to save such specimens before they destroyed the car. In any case, we think the custom of burning up a wrecked car immediately after a wreck is greatly to be deprecated.

A significant fact in connection with the question of the behavior of the car is the general testimony of travelers on the New York Central train that they experienced a comparatively light shock at the time of the collision. The crushing in of the enormously strong floor and framing of a modern passenger car should have given the heaviest kind of a shock to the passengers on both trains. It is said that the wrecked car was only twelve years old; but whether this is the case or not, it is sincerely to be hoped that one result of the present disaster will be that the New Haven Railroad will take out of service several old, and therefore necessarily weak passenger cars, which are to be found on many of the local trains that are running to this city.

THE ELECTRIC ELEVATED TRAINS.

The electric train which is now running on regular schedule time on the Second Avenue line of the Elevated Railway Company has served to show that the new system is an unqualified success, and that the claims as to speed, ease of control, and comparative absence of noise, that were made when the change was projected, are fully justified. It is possible to acquire a speed of 15 miles in ten seconds after starting a train, and it is expected to run express trains at 40 miles an hour when the service is more fully developed. The present train consists of two motor cars and a trailer between them; but the ordinary train will consist of five cars, while in rush hours six-car trains will be run, which will be made up of four motor cars and two trailers. Each of the motor cars will be equipped with two 150-horse power motors, thus giving a total horse power of 1,200 for the whole train. The weight of the motors will aggregate 35,000 pounds. The present locomotives weigh 46,000 pounds, or 11,000 pounds more than the combined weight of the eight motors. Altogether 1,800 of the new motors have been ordered to take the place of the 300 locomotives which have hitherto been necessary to serve all the lines of the elevated system. The eight motors of the train will be controlled by one motorman in a cab at the front end of the leading motor car. The movement of the controller in this cab operates magnetic switches on each motor car in the train, and thus every motor is operated simultaneously by the turn of a single lever. Each motor car is equipped with an electrically-driven air compressor for supplying the necessary pressure for the Westinghouse air-brake, with which all the cars will be fitted. This equipment will take the place of the old Eames vacuum brake with which the cars are at present equipped, and it will enable the motorman to bring the trains up to the stations at a higher speed and stop them at shorter distances than is at present possible. There will thus be a gain in time both in accelerating and retarding the train, and the more powerful brake control will, of course, conduce proportionately to the safety of travel.

TARGET PRACTICE IN THE UNITED STATES NAVY.

It is announced on high authority that in the recent quarterly target practice of the North Atlantic Squadron the ammunition employed footed up to an equivalent of $178,000; or, in other words, more ammunition was fired away in gunnery training than was expended in the battle of Manila. It was this prolonged, and even excessive, firing that was maintained by the ships of the fleet that caused certain weaknesses to develop in the deck supports of the battleship "Alabama." The buckling of beams and angle-irons on that vessel was in no sense due, it is declared, to the premature explosion of shells in the 13-inch guns, but was caused by an inherent weakness of structure which only heavy firing was able to develop.

The premature explosion of 13-inch and 6-inch shells on various vessels of the fleet has been followed by a rigid inquiry into the causes of such accidents, and ordnance officers are now satisfied that the trouble has been due to inefficient gas-fitting devices about the shell bases. It was at first feared that the walls of the common shell were not sufficiently strong, and that fragments of the walls were detached from the interior at the instant of firing and projected through the powder charge. Experiments and tests carried out at Indian Head have given every assurance that the shell walls possess requisite strength. Equally gratifying results were reported from the fuse tests, for in order to make sure that the premature bursts did not emanate from the detonators, exhaustive trials were conducted with a view to detecting the slightest weakness, if any existed, in the fuses. The fuses were found beyond a shadow of doubt to be absolutely safe and thoroughly reliable in action.

With the shell walls and fuses proven satisfactory, the only conclusion open pointed to defects in the shell bases, and under hydraulic pressure it was found possible in a number of instances to force water through the screw threads. In firing work the pressures in the chamber of the gun mount as high as 17 tons per square inch, and evidently where water can be forced gases will penetrate under such enormous pressure. The opinion now holds among the ordnance officials that the premature explosions on the "Alabama" were due to gases effecting an entrance into the shells around the base plugs—a defect that can be easily remedied in future shells.

It is estimated that the annual expenditures in target practice in the United States service will very shortly approximate $1,500,000. Prior to the Spanish-American war the heaviest expenditure was in 1897, when nearly $700,000 was used up in gunnery training. Now, as then, the ammunition allowance per man is greater, it is believed, in the American navy than in any service afloat.

Radical changes have been made of late in the forms of targets employed. Prior to 1898 the triangular target supported on spars lashed to three barrels was in common use, whereas to-day a rectangular target built of wire netting and supported on a raft is the popular form. The rectangular target may be taken in tow and a speed of ten knots secured without fear of towing the raft under or capsizing it on short turns, provided always that some additional spars are taken in tow to serve as holders-down. Red, it has been found, is the best color to paint the wire netting, and at considerable distances a shell hole in the target shows up very distinctly.

The splendid qualities of the new American navy smokeless powder make possible the continued and long firing on the part of our guns, something which is not possible with cordite and some other smokeless powders now in use in foreign services. Sub-caliber tubes are employed on United States ships; but generally speaking, target practice is with full charges. With the machine and smaller guns of the secondary battery there is practically no limit to the ammunition expenditure permissible. A limit is fixed in the heavy guns, but from what can be learned the greatest liberality seems to exist, and some of our commanders are complaining of lack of ammunition. Very recently the cordite ammunition purchased in England for the batteries of the cruisers "Albany" and "New Orleans" was condemned and American smokeless powder substituted. No particular fault was found with the cordite, except that it did not stand up to the work as well as American powder. It is estimated that a 6-inch gun using cordite will lose its accuracy entirely after 175 shots, provided initial velocities of 2,700 foot-seconds be imparted. To prolong the lives of their guns the English are keeping the muzzle velocities of the majority of their guns under 2,500 foot-seconds. In the American service 2,800 and 2,900 foot-seconds service initial velocities will be used on the new guns, and the life of a 6-inch American navy weapon can only be conjectured, for it has not yet been determined in service.

The methods of selecting gun captains in the American navy is practically the same to-day as before 1898. It is laid down as a hard-and-fast rule that before a man can be advanced to a high number at the gun he must first have demonstrated that he is a first-class shot with the rifle and revolver; in other words, the initial training commences on the small-arm firing range. From No. 3 or 4 at the gun the seaman is advanced when he has made suitable proficiency to second gun captain, and if he is an exceptionally good man he may hope for special and higher training on some gunnery vessel. The work of training gun captains is intrusted at the outset to the divisional officers; but later it may be taken up by special officers detailed to instruct on the gunnery ships. But back of all systems is the imperative demand for ammunition to carry into effect the gunnery instructions, and in this respect the policy of the Navy Department has been to provide an allowance of a most liberal sort.

The fact should not be overlooked that our new smokeless powder is not as light in weight as cordite and some other foreign powders and we are, therefore, compelled to carry more dead weight of ammunition than English ships. This fact necessitates greater magazine room, and some slight disadvantage in loading rapidly, but these handicaps are far outweighed by other considerations of greater importance which are all in our favor.

A NEW TRADE ROUTE TO PERSIA.

A new trade route to Persia, via Nushki and Seistan has been opened. Hitherto the trade of Persia has been controlled through three main entries, namely, through Caucasia and Transcaspia in the north, and through the Persian Gulf in the south. The two northern entries are entirely under the control of Russia, while England has always been a predominant power in the Persian Gulf. If, however, the Eastern markets require English goods they have to be carried by caravan across the Dashtidut. This places goods entering Persia from Askabad, which is only 150 miles from Meshed, in a predominant position in Khorassan, which has for centuries been one of the richest provinces of Persia. It is this country, which the Nushki-Seistan route is to feed with Anglo-Indian goods. The Indian railway only reaches as far as Quetta, from which place Nushki is 96 miles distant, and though the country between these two places has been surveyed, at present all caravans start from Quetta, in order to be in communication with the railway. The country between Nushki and Seistan is an absolute desert. The camel grazing is excellent for the whole of the way. Robat is the last British post, and the distance can be accomplished in eighteen marches—5 to Dalbindin, 3 to Merui, and 10 to Robat. As far as Dalbindin the water supply is excellent, and sweet water is obtainable on the present route to Merui. Between Nushki and Dalbindin mud bungalows are being erected at every stage, but from Dal-

bindin onward accommodation is at present only to be found in the thanas, or small forts, except at Merui and Robat, where bungalows are already built. From Robat to the Kuh-i-malik Siah, the point of junction of Baluchistan, Afghanistan and Persia, is only half a march. From Robat it is five marches to Pushtee Das, and from thence extends a difficult journey to Nasirabad, where a British Consulate was first established in January, 1899. From Nasirabad the route is to Birjand, thence to Meshed. On this latter section the country is most fertile, villages full of orchards, rich with fruit, being passed on the way. The bazaar at Meshed is at present full of Russian goods—a fact due to the short distance separating Meshed from Askabad, from which place there is direct communication with Europe. In addition to this advantage, Russia gives large bounties to her subjects in Persia, which not only cover the cost of freight, but leave a little profit for the merchant besides. The only British business interests are at present represented by a branch of the Imperial Bank of Persia, a wool buyer for a large firm. English goods, however, are rapidly gaining infiuence in the town. With the institution of this route, a channel is opened through which English goods can pass with ease into Eastern Persia.

THE ANNUAL MEETING OF THE GEOLOGICAL SOCIETY OF AMERICA.

BY EDMUND O. HOVEY.

The Geological Society of America held its fourteenth annual meeting at Rochester, N. Y., from December 31, 1901, to January 2, 1902, as the guest of the University of Rochester. The convention was well attended, considering the distance of the place of meeting from the large centers of geologic work, and attendance on the programme, consisting of thirty-six papers, twenty-six of which were read in full, was well sustained to the end. Aside from the address of the retiring president, Dr. Charles D. Walcott, director of the U. S. Geological Survey, the most popular interest centered in the papers dealing with physiographic geology and illustrated by means of stereopticon views. Several papers on economic geology were on the programme, but most of them were read only by title. The chief interest of such a convention naturally centers about the address of the president. This was delivered on the evening of the first day of the session and Dr. Walcott took for his subject, "The Outlook of the Geologist in America," and discussed at length the work now being done by national and State geologic surveys, universities, colleges, museums and individuals.

In a few instances funds are contributed to defray research expenses in field and laboratory. In some cases the means of publication are provided. In all cases the teachers of geology are permitted or expected to devote a portion of their time to scientific investigations. In a number of instances State surveys are by legal enactment associated with State universities and the geologic survey of Maryland is conducted under the auspices of a university privately endowed.

Then Dr. Walcott took up in detail and described the work being done by all the various institutions and organizations enumerated by classes and then outlined the problems awaiting solution in each of the great subdivisions of the science, laying special stress, however, upon those confronting the student of pre-Cambrian rocks and the worker along the line of economic geology.

The working out of the larger problems of stratigraphy, correlation, oscillations between land and sea, the migrations of faunas, lines of descent, parallel development, etc., are all awaiting the student. The extent of land areas and the vibrations in character, thickness and distribution of the marginal and deep-sea deposits are imperfectly known. Structural and dynamic problems of the most far-reaching importance are awaiting solution. If the principle be accepted that the classification and delimitation of the greater divisions of the Paleozoic, Mesozoic and Cenozoic eras must rest on the broad biological characters of their included faunas and floras and not on local breaks or differences of sedimentation, important problems remain as to where these lines of demarkation shall be drawn in most geologic provinces. As a result of more detailed studies it is often necessary to revise former methods of classifying and defining sedimentary rocks and igneous masses. The scheme of classification and nomenclature which now expresses the conclusions of our science is not satisfactory.

As an indication of the great activity of the present generation of geologists the speaker cited the fact that in 1899 there were printed 21,600 pages on American geology. Of this vast amount, 12,000 pages were published by State and national surveys, 1,700 pages by geologic journals, 2,000 pages by other journals, 500 pages by the Geological Society of America and 5,400 pages by other associations and institutions.

In closing, Dr. Walcott said that he wished to say a word about the training of the men who will probably reap the largest results from the great opportunities in geology that will be offered during the century. The practical economic geologist will undoubtedly receive the largest financial returns, but in this field, the well-balanced man with the broadest, most thorough training will win out as competition becomes more and more keen. In the more purely scientific lines, a broad, general culture should be the ground-work for special geologic training.

A few months' business training will be almost invaluable to any student who aspires to be more than a directed assistant throughout his career. Business method and habit must underlie all successful administrative work, whether it be of a small party or a great survey. It is needless to say that, as in modern business life, character of the highest standard is essential to permanent success and reputation.

To the well-balanced, well-trained student the outlook in geology in America is most encouraging. It is far more so than when I began work with an honored leader in American geology, James Hall, a quarter of a century ago.

During the past year the society lost five fellows by death. Three men were elected to fellowship in the society in connection with this meeting, namely: Ermine C. Case, instructor in geology, etc., in the State Normal School, Milwaukee, Wis.; Arthur G. Leonard, assistant State geologist, Iowa Geological Survey; Charles H. Warren, instructor in geology in the Massachusetts Institute of Technology, Boston, Mass. The new officers for the ensuing year are: President, N. H. Winchell, of Minneapolis, Minn.; first vice-president, S. F. Emmons, of Washington, D. C.; second vice-president, J. C. Branner, Stanford University, Cal. The social side of the meeting was provided by the annual dinner on the evening of January 1, and by a reception on the evening of January 2, by President Rhees and the trustees of the University of Rochester, at which the fellows had an opportunity to meet the leading citizens of Rochester. Abstracts of the principal papers presented at the meeting will be found in the current SUPPLEMENT.

A SCARCITY OF OFFICERS IN THE MERCHANT MARINE.

The rapid increase, of late years, of the United States Navy and the determination to augment the naval forces of the country to an equality with those of European nations is liable to embarrass the merchant marine, which may be confronted with a possible emergency in a lack of material from which subordinate officers for steam and sailing vessels are chosen. This is the case at the present time on the Pacific coast. The scarcity of young seamen is accounted for in the superior attractions of the naval service, which offers a career of possible distinction, financial reward, freedom from drudgery as well as a chance of promotion which the merchant fleet cannot. Times have changed since the efficiency of the country's navy depended upon the supply of seamen which could be drawn at short notice from the merchant fleet; for no matter how efficient a navigator might be, transferred to a modern ironclad he would be of little account for service until after months of industrious training. The distinction between merchant and naval service is so great as to practically make of them two professions.

While the country is fairly entitled to the services of the best trained men available, it ought, at the same time, to encourage and promote, by all means in its power, the supply of educated officers for the commercial marine. The scarcity of this class of men in Western waters arises from the unprecedented growth of commerce in Pacific waters.

The increasing trade of the Territory of Alaska, sure to be increasingly permanent, employs at least 400 vessels, sail and steam, where less than 40 were required four years ago. In the Hawaiian and Philippine Islands commerce is increasing by leaps and bounds, and will before long require hundreds of vessels to accommodate it, while trade with all the ports of all the countries bordering on the Pacific is growing rapidly. All the indications point to an immense augmentation of the national marine. Every shipyard on the coast, from Puget Sound south to San Diego, for three years past has been working at full capacity to execute orders for new ships, and many shipyards of the Atlantic coast have been kept busy in the attempt to supply the Western demand. Though Pacific shipyards have turned out hundreds of vessels, there is apparently no let-up in the demand. The supply of competent officers for the rapidly increasing fleet has been maintained with difficulty. Ship owners of the coast usually rely upon schools of navigation, which are to be found in all the great ports, to supply the subordinate officers, but the competition of the navy, which gives not only an education but subsistence as well to adventurous young men, has reduced the number available for the merchant fleet. A demand has therefore appeared for relaxing or modifying the rule of the United States Board of Supervising Inspectors, which prevents candidates for licenses from applying before the age of twenty-one years. No person is permitted to apply until after having served three years at sea. The English custom of apprentices begins a practical experience at sea at an early age and permits anyone seventeen years of age to make application for a license and to serve if pronounced competent. The mercantile fleet of England is never without a supply of young officers. The custom of the United States inspectors is to require an interval of one year of service before a new license for an advanced grade is granted; but no matter how studious a young seaman might be, it is rare for him to become master before he has reached the age of thirty or thirty-five years.

It is believed that the rules limiting the age of applicants for licenses, which were adopted in 1878, might be modified to the advantage of navigation by the adoption of the English custom, which is followed so closely in other respects by this country. Such a change in the rules regarding the ages of applicants would, it is believed, render available for immediate service a large number of qualified seamen who are well fitted for the first step in rank, but are excluded from advanced positions on account of youth. A change in the rule would at once release a large number of men who have served a three years' novitiate and are competent for more responsible positions; moreover, by an earlier apprenticeship encouragement would be afforded for young men to make seamanship a profession. Should American shipping be subsidized, as now appears to be probable, a very great increase in the number of this country's vessels would quickly follow, and a lack of experienced officers would be disclosed. Such an emergency would be provided for should the English custom of allowing younger men to apply for officers' licenses, provided in other respects the applicant was properly qualified, be adopted.

SUCCESSFUL WIRELESS TELEGRAPHY AT SEA.

On his arrival here a few days ago, Capt. Hogemann, of the steamship "Kaiser Wilhelm der Grosse," told of the success they had had in working the Marconi apparatus on their last outward trip to Southampton in connection with the fast Cunard steamer "Lucania." It appears the operators on each ship were familiar with the peculiarities of the apparatus on each, and the ships were able to hold aerial converse for nearly three days, until they were about halfway across the ocean.

On December 14, 1901, the "Lucania" sailed three hours before the "Kaiser Wilhelm der Grosse;" when the latter passed Sandy Hook and the "Lucania" was sixty miles ahead Saturday afternoon, they began to exchange wireless messages and signals continued throughout the night. At daybreak the next day, Sunday, the "Kaiser" came in sight of the other ship, and at two o'clock P. M. passed her four miles to the southward. During this time twelve special messages were sent by passengers on the "Lucania" to the "Kaiser" for transmission to the wireless station at the Lizard and thence by land wire to the persons in England to whom they were addressed.

Soon after nightfall on Sunday the lights of the ships were not visible to each other. At noon on Monday their messages showed they were forty miles apart. Early that evening the "Kaiser," when off the Banks, ran into a thick fog; later she came into clear weather and sent the following message:

Twenty-five miles east of Banks. Clear weather.

The "Lucania," then sixty miles astern, replied:

Thanks. Am still in thick fog.

Gradually after this the clicking aboard the "Kaiser" grew weaker until the instrument stopped, when the ships were estimated to be eighty-five miles apart.

On the last trip west the "Kaiser" exchanged wireless messages with her sister ship, "Kronprinz Wilhelm," bound east, when in midocean.

Though they did not sight each other, they exchanged messages and ascertained they were about forty miles apart. They kept up communication for about two hours, several messages being sent by passengers.

The messages received by the "Kaiser" on her trip east were duly transmitted ahead of the arrival of the "Lucania," and when within fifty-five miles of her destination she notified the officials when she would arrive.

Such practical illustrations of the utility of the wireless system of telegraphy leave no doubt as to its value in making the navigation of the ocean safer, for it is a sure preventive of collisions at sea in a fog or at night, by reason of the certainty of advance notification between different vessels.

The wire ropes fastened to some of the most dangerous places in the mountains of the Alps, while they form an important safeguard, have been found to present a new danger as well. They act as lightning conductors, and several tourists were stunned during the past summer, but none of the casualities proved fatal.

THE WELSBACH GASOLINE BURNER.

The Welsbach mantle, which becomes highly incandescent to a hot flame, lends itself so admirably to the hydrocarbon burner that it is by no means astonishing how fast the old kerosene lamp, with its sickly yellow flame, has been supplanted by this more modern and more brilliant light. The interior of the farmhouse can now be illuminated as brightly as a town-house drawing-room.

The introduction of the Welsbach mantle was followed by the invention of numberless hydrocarbon burners, most of which were either unsafe or too complicated. The Welsbach Company, of Gloucester, N. J., itself finally introduced a lamp which certainly leaves nothing to be desired for efficiency and simplicity.

The Welsbach burner differs conspicuously from most similar patented devices for heating a mantle by hydrocarbon gases, in so far as the gasoline is not conducted through unsightly exterior vaporizing tubes passing over the lamp, and in so far as the hand-pump which plays so important a part in many burners is entirely dispensed with.

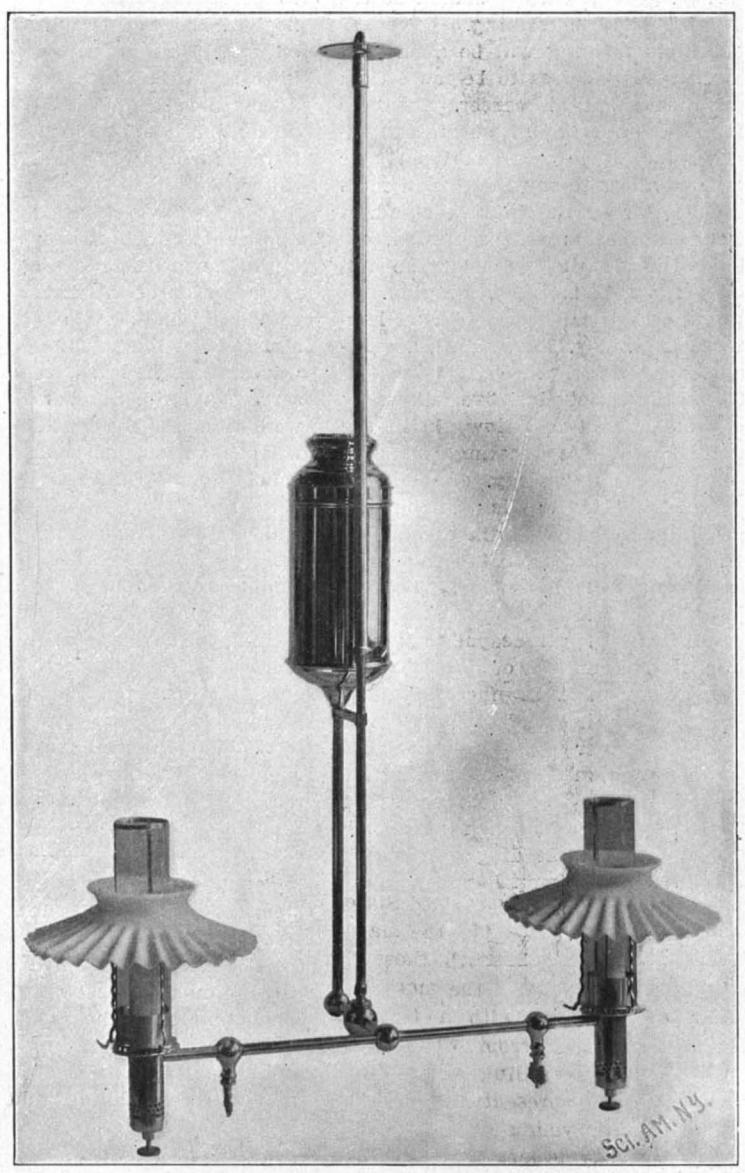
The gasoline is contained in a plain, neat, unobtrusive cylindrical reservoir, from which it is led by pipes to burners of such construction that it is consumed without in any way injuring the mantle.

The burner by which this result is obtained is composed essentially of three separable parts—an interior casting of peculiar form, an outer perforated jacket of sheet metal, and a needle-valve.

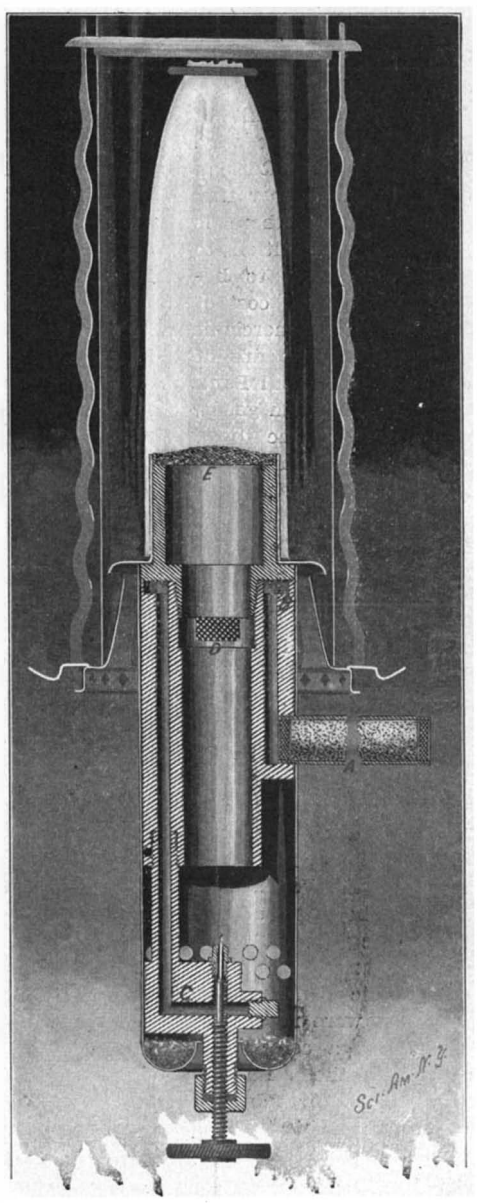
The interior casting is so fashioned that it is provided with an opening for the gasoline inlet tube, *A*, leading from the reservoir previously mentioned; an upwardly extending channel for the gasoline, leading to a vaporizing-chamber, *B*, of circular form; sub-burners, *D*, which serve to vaporize the gasoline in the chamber, *B*; a downwardly extending channel with a branch, *C*, extending to the bottom of the burner, and having a feed opening which is controlled by the needle-valve previously mentioned; and finally a brass gauze burner, *E*, which constitutes the burner proper and by which the mantle is heated to incandescence. Over this casting fits the thin, nickeled jacket, formed with an opening at the middle to permit the entrance of the sand-filled gasoline pipe, *A*, and perforated near the bottom to permit the air to mingle with the vaporized gasoline. The bottom of this outer jacket constitutes a receptacle for alcohol-soaked asbestos which, when ignited, serves as a preliminary heater to start the burner.

Upon leaving the stop-cock on the fixture arm, the gasoline passes into the tube, *A*, packed in sand held in position by gauze caps. The gasoline after having been thus filtered rises in the channel provided for it in the casting and reaches the vaporizing-chamber, *B*. The gasoline, after having been vaporized by heat supplied from the sub-burner, *D*, passes down the opposite side of the casting through the channel previously mentioned, and finally reaches the branch pipe, *C*, in a gaseous form. The vaporized gasoline escaping through the minute opening controlled by the needle-valve is mingled with air entering by way of the perforations of the outer jacket. The mixture thus formed travels upwardly through a central tube in the casting, reaches the burner, *E*, and is there ignited, producing a hot, colorless or pale blue flame which serves to heat the mantle to incandescence. The alcohol-soaked asbestos in the bottom of the outer sheet-metal jacket serves to heat the generator before the lamp is ignited, the gasoline at the time of heating not being turned on at the stop cock. After the generator has been sufficiently heated by the alcohol to be able to vaporize the gasoline, the stop cock is open and the gasoline allowed to flow into the burner, there to be immediately vaporized so that it can be ignited by a match held over the burner. After ignition, the device continues to operate spontaneously, gasoline entering by way of the pipe, *A*, becoming vaporized at *B*, mixed after leaving the pipe, *C*, and ignited at *E*.

As we have previously remarked, the burner is so constructed as to vaporize all gasoline that flows into it perfectly, irrespective of drafts or extremely low temperature. This vapor is mixed and properly controlled with extreme nicety by means of the needle-valve. The simplicity of the construction which characterizes these burners reduces the possibility of the lamp's getting out of order, and also permits the various parts to be readily cleaned. Used in conjunction with Welsbach gasoline mantles, these burners give a light equal to that of 100 candles at a cost of less than one-fifth cent per hour. In other words, for one cent a night, one can have practically all the benefits of city gas in its most approved and brilliant form of incandescent lighting with trouble less than that associated with the handling of an ordinary kerosene lamp. The lamps give no odor, are free from dirt, are smokeless, and do not discolor ceilings.



THE WELSBACH BURNER AS ADAPTED FOR THE USE OF GASOLINE.



Section showing details of Welsbach Gasoline Burner.

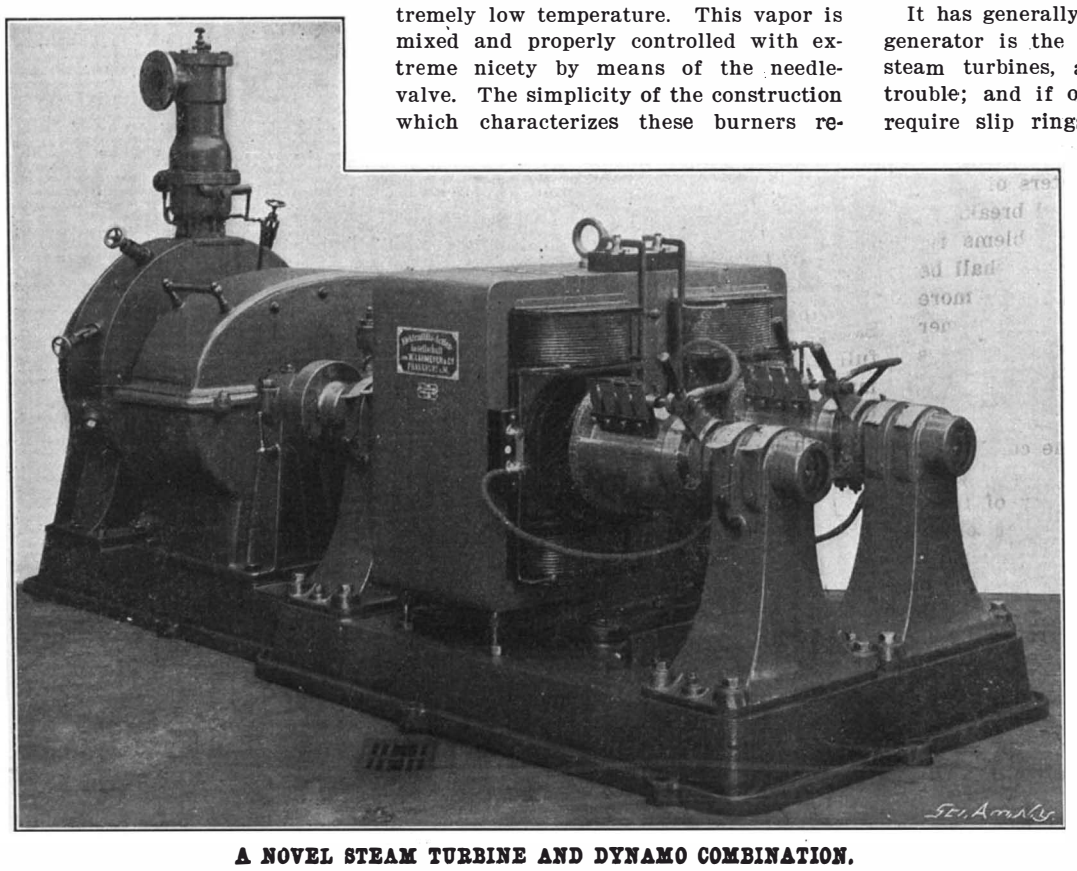
A consular report from Frankfort, Germany, gives the particulars of the plans of a new stone arch bridge now being built over the Petrusse River, at Luxemburg, Germany. The span of the arch will be 275.6 feet, and the roadway will be 144 feet above the river. According to the plans there will be two arches 19.7 feet apart, the total width being 52½ feet. The stone used is being furnished from quarries in the immediate vicinity. The materials required are as follows: Masonry, 776,925 cubic feet; wood for scaffolding, 28,252 cubic feet; metals (iron, zinc and cables), 45 tons. The bridge will cost $270,000, and is being built by the government of the Grand Duchy of Luxemburg at its own expense. Preliminary work was commenced in December, 1899, and it is intended to open the viaduct for traffic in the spring of 1903.

NOVEL STEAM TURBINE AND DYNAMO COMBINATION.

The steam turbine is coming more and more into general service for power work both in this country and abroad, but one of the special fields which open to it great opportunities is that of generation of electrical currents for both light and power purposes. The dynamo, being easily designed for high speeds, is particularly well adapted for operation by steam turbines, which are necessarily high-speed machines.

The higher the speed of an electric generator, the less the cost of construction both for materials and labor, and bipolar dynamos may do the work which at lower speeds requires four-pole or multipolar types.

It has generally been conceded that the alternating generator is the best type of dynamo for use with steam turbines, as it has no commutator to give trouble; and if of the inductor type, does not even require slip rings for taking off the current, both armature and field windings being stationary. Direct-current machines have been used, however, to a considerable extent, and it is with interest that we note the peculiar construction of the German outfit in the accompanying illustration. It consists of a steam turbine of 100 horse power mounted on the same base and operating a double direct-current generator, having two armatures, two fields and two sets of bearings, and in reality practically amounting to two machines. The two fields of the dynamo, however, are wound on one frame, and one pair of leads deliver a continuous current of 110 volts potential. This combination was built and installed by the Electricitäts Actien Gesellschaft, vorm. W. Lahmeyer & Co., of Frankfurt a. M., Germany, to whom we are indebted for the accompanying illustration.



A NOVEL STEAM TURBINE AND DYNAMO COMBINATION.

THE LANGEN SUSPENDED RAILWAY OF BARMEN-VOHWINKEL-ELBERFELD.

BY PROF. DOLEZALEK.

On March 1, 1901, the suspended railway connecting the three German manufacturing towns of Vohwinkel, Eberfeld, Barmen, some 13.3 kilometers in length, was partially opened to the public.

The road is built on a system of latticed longitudinal girders, one vertical and two horizontal, assembled into the form of an I-section. The main girders form the web of the I; and the lateral girders, which give the requisite lateral stiffness, serve as the top and bottom flanges of the I. Diagonal tie-rods extend from the upper panel points of the central girder to a connection with the chords of the bottom lateral girder. The last-mentioned chords consist of steel I-beams, and upon their upper flanges is laid the single T-rail, from which the cars depend and on which they run. The girders, which vary in span from 21 to 33 meters (68.88 feet to 108.24 feet), are carried upon supports varying in structure with the locality where they are used. Where the railway is carried immediately above the Wupper River, the A-frame style of pier is used; while in the towns through which the line passes, the trusses are carried upon substantial U-frames. The A-frame consists of two rectangular latticed struts, which are united at the top by a rectangular plate yoke.

The supporting structure of the road, including trusses and piers, has an average weight of 1,100 kilogrammes per meter, which is due primarily to the great length of the girders and unusual height of the supports at Elberfeld. Under more favorable conditions this weight could be reduced.

The cars are 11.5 meters (37.7 feet) long, 2.6 meters (8.5 feet) high, and 2.1 meters (6.88 feet) wide; are therefore fairly long and narrow, and are slightly tapered at the ends. They have a seating capacity of 50, and are built with two side doors opening inwardly, and two auxiliary doors at the ends. The total weight of each car is twelve tons. The cars are freely suspended from two trucks spaced 8 meters apart and equipped each with two wheels, double-flanged and having a diameter of 0.9 meter. The wheels are mounted in tandem to run on a single rail, and are driven by two electric motors of 36 horse power each, through the medium of transmission gearing. The motor-trucks receive current by means of a slip-shoe and a contact rail, which is carried on the bottom of the lateral girder, somewhat to the inside of the main supporting I-beam.

The truck-frames embrace the rail-girders and the rails so closely that a play of only 7 millimeters is allowed, and that derailment is impossible. If a wheel or axle should break, the cars would be held up by the frames.

Oscillation of the car is limited by two projections on the lower part of the hook-shaped frame, as shown in one of our diagrams.

The cars swing around the curve in a slightly inclined position and spontaneously reassume their normal vertical position when a straight part of the rail is reached. To the passengers the change in equilibrium is imperceptible. Since a sudden change of equilibrium causes an oscillation proportionate to the velocity and the angle determined by the radius of the curve, which oscillation lies within twice the value of this angle, comparatively long transitional bends have been provided, by reason of which the equilibrium is gradually changed, with the result that almost inappreciable oscillations are produced.

On the supporting structure at Elberfeld the maximum oscillation is 15 deg., corresponding to a speed of 55 kilometers per hour on a curve having a radius of 90 meters. On an experimental line in Deutz the axis of suspension swung 26 deg., so that curves having a radius of 90 meters can be rounded at a speed of 75 kilometers per hour, and curves of 350 meters at a speed of 150 kilometers per hour.

The actual speed of the Barmen-Elberfeld-Vohwinkel line has been temporarily fixed at 40 kilometers per hour, but will soon be increased to 50 kilometers per hour, so that the average speed, including stops, will be 30 to 36 kilometers per hour, and so that entire length of the road, 13.3 kilometers, can be covered in 25 minutes.

In the experiments which have been made an acceleration of 0.6 meter and even 0.8 meter per second was obtained at the start. Even with an acceleration of only 0.5 meter per second, the prescribed speed of 40 kilometers per hour will easily be attained.

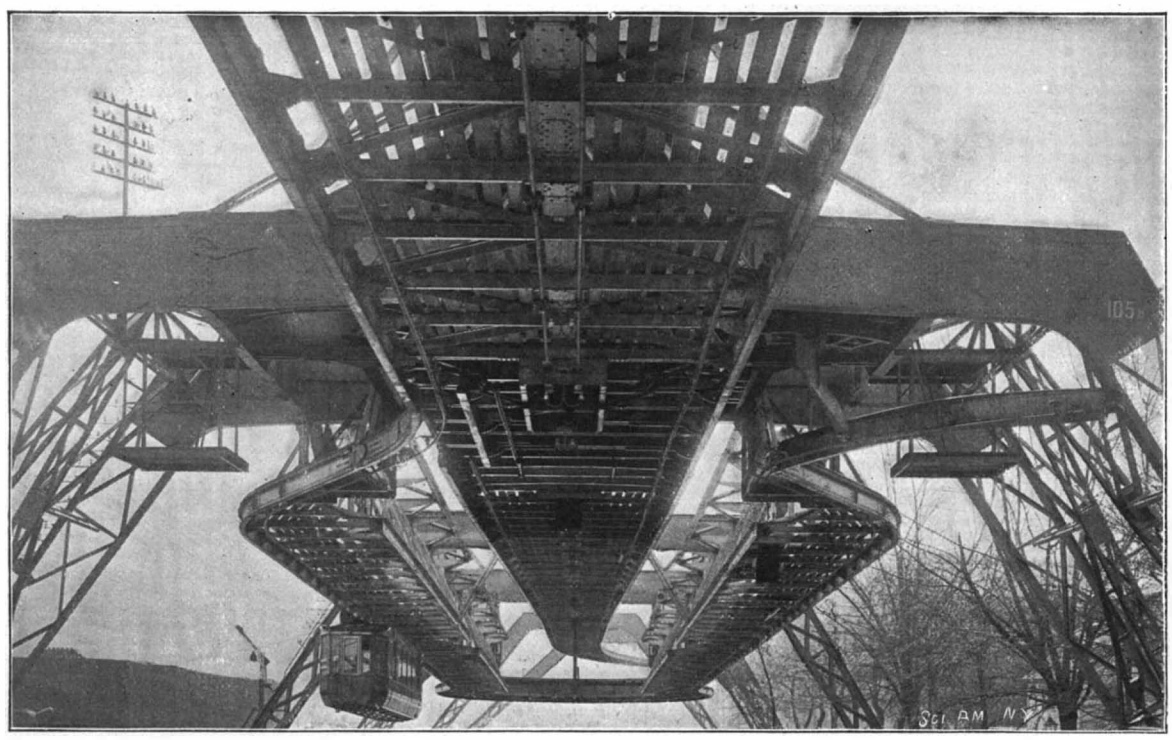
During the experiments, the brake retardation could be considerably increased to more than 0.5 meter per second. With a brake retardation of 0.75 meter per second, it would be possible to brake the cars within about 80 meters.

The cars are fitted with a Westinghouse air-brake, a hand brake connected up with the air-brake, and an electrical brake, while an emergency stop can be made by reversing the motors.

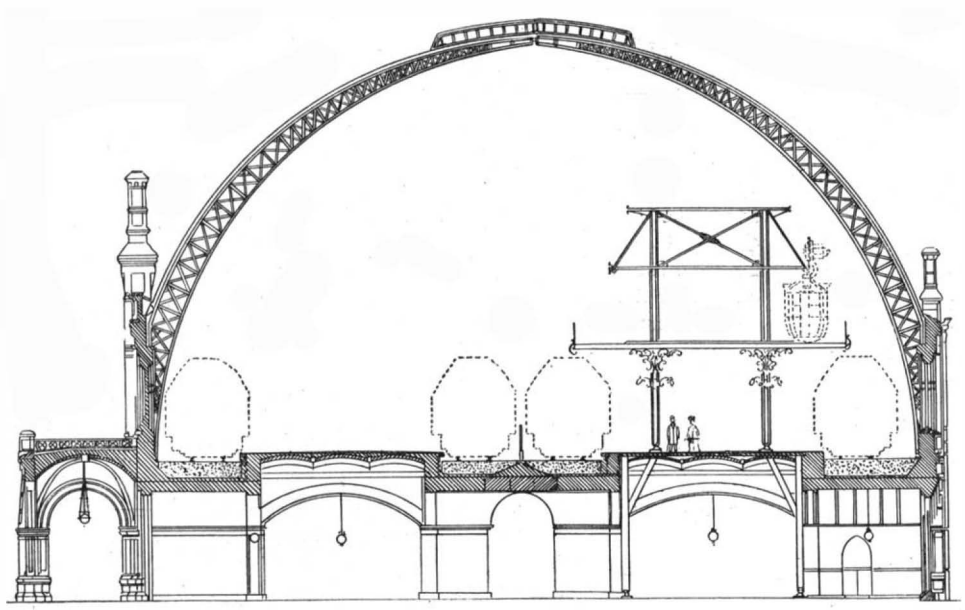
There are eighteen stations on the line, which are built on structures at about 4.5 meters above the ground. This elevation was necessary in order not to interfere with street traffic in the towns. The rails run straight through the stations. Covered staircases lead from the ground to the station platforms.

Within the station and extending through its entire length a wire-netting is stretched between the tracks for safety. Rocking of the cars, as passengers are received and discharged, is prevented by means of springs mounted beneath the cars and arranged to slide on wooden longitudinal beams of the station platform. The return-loop at the Zoologischer Garten is so constructed that, by means of a lifting-switch, and a sharply-descending rail, the cars are switched beneath the main track, around to the opposite side, and finally by means of a lifting switch and an ascending guide-rail, to the track leading in the opposite direction.

The system is fitted with an automatic block system, in which the signals are regulated by the car itself, and, consequently, the headway between the trains may be reduced, if de-



The Return Loop at the Zoologischer Garten Station.



Station at Friedrichstrasse, Showing Intermediate Station.

The Station at Doppersberg.

THE LANGEN SUSPENDED RAILWAY.

sired, to two minutes. The electrical equipment has been duplicated, so that in case of accident or necessary repairs traffic will not be blocked.

In order to give the whole structure of the road longitudinal stability, rigid double A-frames, with a broad fixed base, are introduced at intervals of about 900 feet, the intermediate A-frames being provided with ball-and-socket joints. By reason of this arrangement, the intermediate posts, or A-frames, as the case may be, are free to move in a longitudinal direction, and accommodate themselves to the expansion and contraction of the supported spans.

In that portion of the line which is built above the river, the total weight of the structure, including the supporting struts or piers, is less than 850 pounds to the foot, while the weight of the portion above the roadways, where inverted U-posts are used, is 785 pounds. When it is considered that the length of the spans average about 100 feet it will be seen that the structure has been designed with a due regard for economy of material. The road cost between $200,000 and $225,000 per mile, including the foundations and the stations. If the equipment be included, the cost may be placed at about $265,000 per mile.

The Charleston Exposition.

BY GEORGE E. WALSH.

The Winter Exposition is something unique and novel even in this age of exposition-making, and probably few cities can offer the climate favorable enough to make such an enterprise successful. Charleston has the peculiar geographical location which makes it accessible to Northern and Southern cities, and with a winter climate that can be described neither as hot nor cold. It approximates that "happy medium" between our extremes of temperature which most people desire.

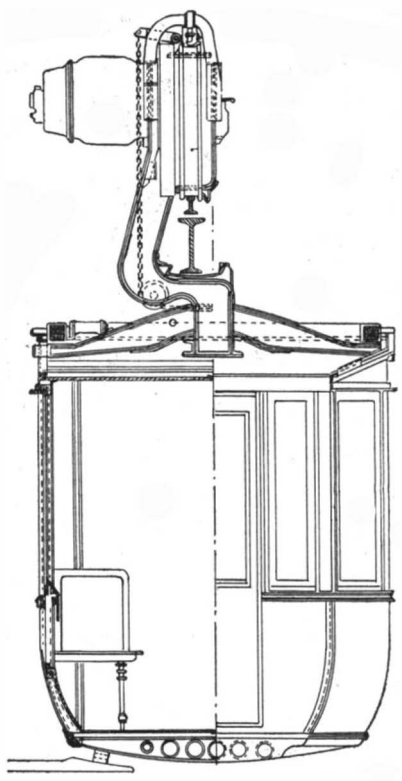
Situated not far distant from the temperate and tropic zones, the historical city by the sea which appeals this winter to those who love expositions, furnishes an opportunity to learn about the products and habits of life of a tropical and semi-tropical part of our western hemisphere that is rarely accorded to any people. The city is practically a key to the great commercial life which pulsates among the islands of the tropics off our South Atlantic coast, and which each year is becoming more important to us. Charleston is a seaport that has no superior for stimulating the growth and development of the trade with the West Indies and this country; and while our Southern States produce many of the articles of a tropical and semi-tropical nature, there is less rivalry than mutual advantages obtained through exchanging of products with the islands of our coast. Only in an accidental way do we appreciate the importance of this West India trade; yet we sell more merchandise to the West Indies than to all the fifteen republics of South and Central America. Our Pan-American Exposition and Pan-American Congresses are all intended to stimulate a future trade with South America; but here with the West Indies is a trade already in our possession, and yet not half developed. The islands to-day are looking to us to supply them with most of their manufactured goods, and in exchange they offer to send to us the tropical products of their fields and orchards.

In the year 1900 we sold to the West Indies goods to the amount of $47,436,677. Compared with the value of our products sold to some other countries which have received far more advertising one may find food for interesting study. In the same year our trade with the South American republics reached a total valuation of $42,373,255; with China, Japan and Asiatic Russia combined, $47,396,744; and with the combined countries of Greece, Turkey, Switzerland, Norway and Sweden, Spain, Portugal, Russia and Austria-Hungary, only $45,089,368. Our trade with the comparatively little-talked-about West Indies suddenly looms up in true proportions when such comparisons are made, and we manage to find more enthusiasm on the subject. Charleston in holding its Winter Exposition for the purpose of exhibiting the products of these islands, as well as those of the South, intends to draw into closer union the interests of the West Indies and those of this country. As a factor in the American expansion of our commerce these islands of the Atlantic must prove of the greatest importance to the South.

The display of the products of the West Indies at the Winter Exposition is of the finest, and the visitor there is enabled to get a very comprehensive idea of the resources of the island. Likewise the exhibits of the American products which the average West Indian will need are made with singular simplicity of aim and desire. The West Indian trader can study what he needs and find suggestions for his own improvement.

Naturally in such an exposition the chief exhibits are of products which the group of South Atlantic States are most interested in. These include cotton, sugar, tea, rice and tobacco. These products, from one of the oldest and richest of our agricultural sections, are in constant demand in the West Indies in one form or another. Most of the cotton raised in this country comes from a group of the States on the southern Atlantic seaboard most interested in this exposition; and since cotton mills have become almost as numerous there as in New England, manufactured goods of this product will figure as important factors in the future development of that section. It is not without good reason, therefore, that the Charleston Exposition endeavors to draw the West Indian traders to a seaport which aspires to control a trade that is bound to expand as time goes on.

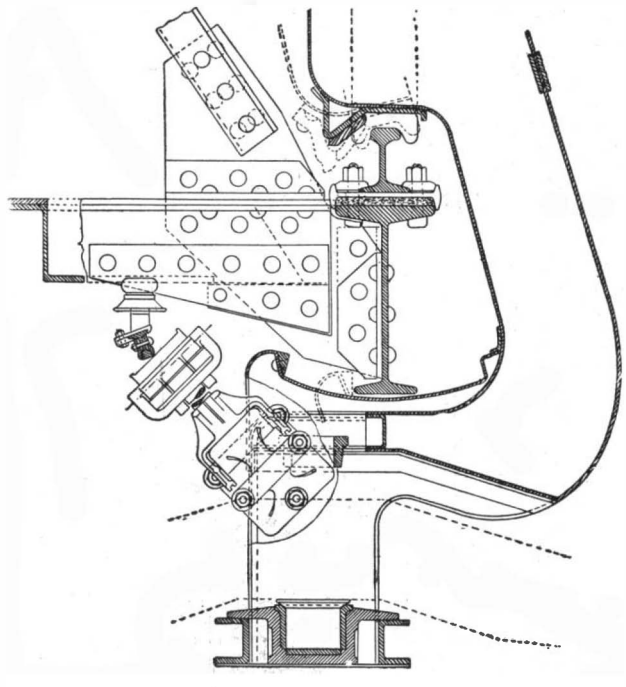
The fact that most of these islands off our coast



PARTIAL CROSS-SECTION AND REAR-END ELEVATION OF CAR.

are owned by European nations, who merely use and exploit them as colonies, makes the trade relations between them and this country all the more interesting and valuable. Great Britain's flag waves over fifty-six of the islands, the Netherland's over five, France's over three, and Denmark's over three. By their geographical position and natural trade conditions they should either belong to this country or be independent and commercially bound to us; but political rulings have arbitrarily changed their destinies, though not their actual trade development.

Trade conditions between this country and the West Indies are further emphasized by a comparison of the consumption of our goods according to the population of the islands. Thus during the year 1900 the people



METHOD OF SUSPENDING THE TRUCKS.

of the islands imported from this country our surplus goods, per capita, to the extent of $7.90. The imports, per capita, in China of our goods amounted to 3 cents. The same proportion existed between the people of the Philippines and our exports to the islands, while the South American republics imported goods, per capita, from us to the extent of $1.13. Considered from any point of view the trade with the West Indies is one of the most important we have, and anything to encourage and stimulate it must be of general benefit to the whole country.

An egg of the great auk was recently sold in London for 240 guineas.

Correspondence.

Power from Rivers.

To the Editor of the SCIENTIFIC AMERICAN:

How to utilize the water power in navigable rivers is a problem which has received but little attention from engineers. In these days of big accomplishments, when capital seeks investments in the largest enterprises, it is strange that an attempt has not been made to wrest power from the big, sluggish rivers which have played so important a part in the development of our country.

To stimulate thought on this subject I submit a plan for using this wasted power.

Supposing it is decided to take power from the Missouri River at Omaha, Neb., the power to be used for traction and lighting purposes. We will say that the average fall of the river for ten miles is seven feet to the mile, or seventy feet to the ten miles. We lay a dozen lines of pipes, each two feet in diameter, on the river bed from Omaha to a point ten miles up the river.

By having the upper ends of the lines of pipes terminate at a foot below the surface and near the bank, so as to leave the river clear, we would have a power at the lower end which would raise twelve columns of water, in pipes, sixty-nine feet above the surface of the river. The power which could be thus utilized would be limited by the number and strength of the lines of pipes, which could extend any distance up the river.

The first cost of a plant constructed on this plan would be large, while the maintenance and operating expenses would be comparatively small.

EDWARD P. SHARP.

Lincoln, Neb., December 31, 1901.

[There are plants erected on this system in various parts of the country.—ED.]

An Esquimau Arrow.

To the Editor of the SCIENTIFIC AMERICAN:

A few days ago a very large wild goose, weighing 16 pounds, was shot and killed by a hunter on the shores of Lake Liberty. This body of water is located in the Spokane Valley, about 12 miles from the city of Spokane, Wash.

The hunter was standing near the lake, when a flock of geese came winging their way from the north and settled in the tall hedge. He shot and brought one down.

As he picked up the big honker, he was surprised to see a piece of polished ivory protruding from the breast of the goose. The ivory projected about two inches. With great difficulty the man pulled the stick out, for the flesh had grown tightly around it, and the wound had entirely healed.

He then saw that it was the long, sharp point of an arrow, which was made of ivory, about eight inches long, and as large as an ordinary lead pencil.

There are some queer, delicate carvings on the ivory where it had been attached to the arrow-stick. No such arrow has ever been seen in this part of the country, and it could not have belonged to any of the Indian tribes. The Indians in all these regions have, for many years, discarded the use of bows and arrows.

Evidently, the bird has borne the arrowpoint for thousands upon thousands of miles from the far Arctic regions where it had been shot by some Esquimau hunter. The point was deeply embedded in the flesh of the breast, and had touched no vital spot. In the bird's long flight, the arrowstick had doubtless been broken off. The goose was a full-grown male, and had probably received the wound a long time ago.

Some returned Cape Nome miners pronounce the arrowhead of Esquimau manufacture. It will be preserved in the State Museum.

J. MAYNE BALTIMORE.

Bossburg, Wash., December 30, 1901.

The Current Supplement.

The current SUPPLEMENT, No. 1360, has for its first page engraving a portrait of Mr. Marconi, and in the article his recent address before the American Institute of Electrical Engineers is given. "The Need of Direct Steamship Service to Africa" describes conditions which warrant the opening of an American line. "Locomobile Steam Carriage" gives a detailed drawing showing a full section of the carriage. The Meeting of the Geological Society of America is specially reported for the SUPPLEMENT by E. O. Hovey. The Annual Report of the Secretary of Agriculture is continued.

In the course of two years, a thriving town, known as Deferiet, and a gigantic paper mill have been built and put into operation on the Black River, New York. The mill is that of the St. Regis Company and it has a capacity of one hundred tons per day. An investment of two millions is represented in the company's holdings at this point.

Automobile News.

For the purpose of overcoming the inexplicable prejudice of many of the provincial county councilors of Great Britain to the motor car, the Automobile Club of London proposes to inaugurate a series of trials, for the purpose of obtaining accurate and incontestable information as to the length within which motor vehicles may be stopped when traveling at various speeds. The trials will also afford an excellent opportunity of demonstrating how impossible it is for bystanders to gage accurately the speed of motor vehicles, as most of the aversion to motor cars is based on ignorance of their capabilities, especially in the matter of stopping suddenly when going at a high rate of speed.

Although electrically-propelled vehicles have proved a failure in London, they have proved successful in other parts of Great Britain. During the trials of automobiles at Glasgow, during the exhibition, one electric motor car accomplished a very satisfactory performance by traveling 1,000 miles without an accident. The car first ran from London to Glasgow, a distance of 486 miles, climbing several steep hills, including a severe gradient up a mountain in Cumberland, ten miles long, rising to a height of 1,250 feet above the level of the main road. The accumulator used, although of special design, was only special in that it was a special development of the line upon which all inventors are advancing in this matter. After being driven to Glasgow the car participated in the trial runs around the city and the neighborhood, covering 285 miles in all. It was then conveyed to Liverpool by ship, and ran a further 386 miles, by Birmingham, Bristol and Salisbury, back to London. The day's runs were such as any motor car might take, stopping at convenient places en route, the distances between stops measuring from 40 miles to 84 miles. The total costs of the run 1,172 miles worked out to 5 cents per mile.

The government of Cape Colony are having constructed in England a number of motor "quads," or light four-wheeled machines, for use on the Cape lines which need protection against rebels and Boers. Mr. Donald Menzies, a well-known colonial engineer, is responsible for the idea, and has prepared the specifications of the machines. Each vehicle is to have a carrying capacity for six men and is to travel at a speed of 30 miles per hour. The weight of each motor quad is not to exceed 135 pounds. Several of these vehicles are already in use, and have given the greatest satisfaction in patroling the line. The vehicle is built with tubing and is pneumatic-tired. Flanges attached to the wheels prevent the "quad" from leaving the line, and by its means rapid scouting on the railways is possible. It carries sufficient oil for a three days' journey. The "quad" is eminently adapted to scouting, since it affords a much less conspicuous target to the enemy's fire than a railway engine, and it can be lifted off the track by a couple of men should a break in the line render it necessary. Moreover, it can travel at a greater pace than would be safe for an engine on some parts of the Cape lines. It is proposed to supply every section of the Cape Colony railroads with these motor vehicles.

Visitors to the Paris Automobile and Cycle Show will no doubt be surprised at the great advance which has been made in the application of alcohol as a motive power. In France this is an especially interesting question, as alcohol is a home product, while the petroleum used in so many machines is imported from America or Russia. Consequently every effort is being made to develop this branch of the industry and the Minister of Agriculture is especially interested in the subject. The basement of the Grand Palais will contain some novel exhibits devoted to alcohol production and different types of motors and automobiles will be well represented. The large vault will be handsomely fitted up and lighted by electric or the new alcohol lamps. The main wall is covered by an exceptionally fine decorative design by Jambon, representing the Production of Alcohol. A model farm will be shown which is operated entirely by alcohol motors, including reapers, thrashing machines, mowers, etc. The center is reserved for a large exhibit of automobiles which use either pure alcohol, or a mixture of gasoline and alcohol. The De Dion-Bouton Company are to have a unique exhibit to show their new type of small alcohol motor applied to domestic operations such as wood-sawing, corking of bottles, and butter making, as well as for different industrial purposes. The immense hall of the Grand Palais will be devoted, as last February, to the main exhibit of automobiles and motors of the regular types and will also include many novelties. One of the "clous" of the Automobile Show will be the famous balloon No. 6 of Santos-Dumont, which gained the Henri Deutsch Prize. The aeronaut had dismounted the balloon and intended to take it with him to Nice where he is to continue his experiments with a view of passing across the Mediterranean, first to Corsica, then to Africa. However, he was prevailed upon to send it instead to the Automobile Show, and will use instead the No. 7 which he is now constructing.

Engineering Notes.

The British Admiralty proposes to remove the cowls and other ventilating apparatus from the decks of warships, experts having decided that they retard the speed of vessels.

The Pennsylvania Railroad is now experimenting with ties imported from Demerara, British Guiana. The ties are hardwood and are expected to last a long time while in service. It is said that they will last about fifty years. The ties will be used on the main line and several places in the vicinity of Philadelphia, and will cost about $1.50 each delivered in Philadelphia.

An incident showing the value of quick wit in taking advantage of the situation in an emergency occurred on the coast of England, where a number of pilot-boats and fishermen, having been caught in a storm, ran for the harbor, but failing to get quite into safety made for the end of a long pier which was being erected where there was a "Titan" crane. The boats were run under it and hitched on to the tackle, when five boats and fifteen men in them were lifted bodily into port.

American street railway promoters have invaded St. Petersburg, and have, according to a dispatch to The London Standard, submitted a proposal to take over the entire tramway system of that city under a twenty-five years' contract, the lines to be relaid and extended in all directions, and horse cars to be replaced by electric cars. The scheme includes the building of a substantial bridge across the River Neva to replace the existing wooden structure. The capital, to be raised in the United States, will be 100,000,000 rubles, half of which will be in ordinary shares and the remainder in guaranteed.

The English railway managers who came to this country a few weeks ago to investigate our systems in their specialties were treated to a run on a fast train, which must have enlightened them somewhat as to the speed possibilities of American locomotives. The train weighed 210 tons behind the tender (without engine and tender) and consisted of five cars. A run of 55½ miles was made at the rate of 71.6 miles per hour, including three checks. During this run 35 miles were covered at 81½ miles per hour, and one mile at 85.7 miles per hour. The last two miles were run to a dead standstill in 120½ seconds.

The thoroughfares of Paris, like those of London, suffer severely from congested traffic, which considerably retards business. The Parisian municipal authorities are contemplating the construction of underground methods of rapid communication. M. Cassalonga, the well-known engineer, has prepared a scheme for relieving the congested state of the street traffic in various parts of Paris, by means of a subterranean moving platform, similar to the traveling footway which was one of the novelties of the last Paris exhibition. The revolving footway, which is to have perpetual motion, would be divided into four sections, the fastest traveling at the rate of thirteen miles an hour.

In view of the magnitude of British interest in the petroleum industry, a Petroleum Institute has been founded in London for the purpose of affording technical and scientific instruction in relation to the industry, and to serve as a central bureau for the dissemination of information concerning it. The project has met with the approval of many of the leading companies interested in petroleum, and arrangements have been made for a number of their engineers and managers to deliver lectures at the new institution. Courses of addresses will be delivered dealing with the historical, geographical and geological aspects of the industry. The extent of the British interests in petroleum may be gathered from the fact that upward of $125,000,000 capital is invested in the industry, while the value of the tank steamers engaged in the distribution and carriage of the oil flying the British flag, represents another $50,000,000.

A serious blow has been struck at the export trade of British sewing machines to Germany by the levy of a prohibitive tariff upon this domestic article, whether it be of English or foreign manufacture. The new duty on cast-iron stands with machine will vary from $1.25 to $5, and on hand-power sewing machines it will run as high as from $6 to $9. Last year Germany imported 83,916 hundredweight of sewing machines with stands. Of this large amount, 66,866 hundredweight came direct from England either as of British make or transshipped from England, equivalent to a value of more than $900,000. This new tariff will affect our sewing machine export trade as well as that of England. Last year Germany bought from us sewing machines of the value of $1,125,000. It is anticipated that the levying of this new tariff will considerably assist the home manufacture of Germany, and will also increase the export trade of that country in this connection to an appreciable extent. Last year the German export trade in sewing machines increased by 40,000 hundredweight.

Electrical Notes.

The gross earnings of the summer parlor-car service of the Brooklyn Rapid Transit Company to Coney Island were $4,812.

The Milan-Turin-Paris telephone line is now being finished and will soon be ready for service. This will be the first international telephone communication of Italy. A second line from Milan to Zurich will be completed in a few months, as it only remains to finish the section from Como to Chiasso on the Swiss frontier. The line from Milan to Paris will connect the Italian telephone system with London, and the Zurich line with Berlin. It is expected, however, that a direct line will be run from Milan to Berlin.

The Athens-Piræus railroad is soon to be transformed to the electric system, using the overhead trolley, and bids have been asked from leading electric companies. It is expected to thus have the trains circulate 15 to 30 minutes apart, according to the season. The trains will be provided with freight cars, but there will be besides a regular system of freight trains. These latter will be drawn by electric locomotives, while the ordinary trains will use motor cars. This line has a continuous grade of 1.4 per cent.

The Earl of Crawford has devised a means of manipulating a vessel's rudder by means of electricity from any part of the ship. A practical demonstration of the invention was recently given upon the inventor's steam yacht "Valhalla" in the Solent before several representatives of the British and Japanese navies, who were considerably impressed with the device. It is stated that the British Admiralty proposes to give the invention a thorough trial upon one of the battleships. The most prominent feature of the device is that it is not so liable to accident as the steam gear, and it is much easier to manipulate.

The boats on the Miami and Erie Canal from Cincinnati to Toledo will shortly be towed by electric locomotives, says the Mechanical Engineer. These locomotives will each be equipped with two 125 horse power alternating-current motors of the Westinghouse type. In the city the current will be delivered at 380 volts and in the country at 1,100 volts. Along the first section of the line, from Cincinnati to Dayton, there will be four transformer stations, and current will be delivered from lighting plants in the various towns at 33,000 volts. When towing boats the locomotives will have a speed of about three miles an hour, but by cutting out one of the motors this can be increased to six miles an hour, when it is desired to cut loose from the boats.

A detonator for dynamite has been invented by M. Aubert, of St. Etienne, France, says The Engineer. It is intended for use in coal mines where gas is present in dangerous volume and it is operated without the use of electricity. A copper tube receives the end of the fuse for several inches; and at the other end of this tube is a percussion cap similar to those used in toy pistols. This cap lies against the side of the tube, which is there pierced by a small hole, and the fuse end is only 0.07 inch from the cap. The end of the tube containing the cap is inserted into another copper cylinder containing the firing mechanism. To operate the apparatus the outer tube is held in the hand and a smart blow on a button explodes the cap; the gas from the burning fuse fills the cylinder, but is prevented from escaping outside by the metallic gauze which covers all openings in it.

The directors of the Mersey Tunnel Railway hope, in January, 1903, to run their system by electricity, says The Mechanical Engineer. The desirability of this reform, both on the score of speed and cleanliness, has long been recognized by the directorate, but monetary difficulties have until now prevented its initiation. The three-rail system, similar to the one employed on the Liverpool Overhead Railway, will be adopted. There will, however, be a slight difference in arrangement, to meet the special requirements of the Board of Trade. On the Overhead Railway the positive, or working, electric rail is in the center of the track, and the running rails are utilized as the negatives. In the Mersey Tunnel the "positive" will be just outside the metals, and, to keep the running rails entirely free from electric current, a "return" rail will be laid in the middle of the track. Electric motors, and not engines, will be used, and the cars will be 60 feet in length, capable of seating 60 passengers, "first" and "third" class only. All preparations for commencing the work of conversion are now complete, and the various sub-contracts have been let. Already the foundations of the generating station, which will stand in Shore Road, Birkenhead, adjoining Hamilton Square Station, are being made, and the building proper is to be commenced in the coming spring. To meet the anticipated increase of traffic the lifts at James Street will be fitted with two sets of doors—one for entrance, the other for egress only. The lifts themselves will still be worked hydraulically, but the necessary power will be supplied by electricity instead of by steam, as at present.

TRADES AND CRAFTS IN THE OLD SPANISH MISSIONS.

BY E. T. MILLS.

Looking back at the work accomplished by the fathers of the old Spanish missions, one is deeply impressed with the extensive and rapid progress that they made, as well as by the wide learning which they were enabled to transmit to the races about them.

The wilderness was conquered in weeks. Great trees were torn from the mountain-tops to aid in building spacious halls and corridors which have withstood the tide of more than a hundred years. Agriculture and mining flourished side by side with manufacture and trades of all descriptions and kinds.

Religious and other training was speedily introduced. An unlettered, unenlightened, foreign people were subdued and taught all the arts of the enlightened, well-schooled peoples of European countries. And all this was done in a miraculously short period of time. More than that, the work accomplished by these pioneers of Western civilization, as shown by the relics from their workshops now in existence, is of superior quality to that which may be found in many factories of the present day.

Each priest that came to this country was a master mechanic; he knew something of all trades and much of many. He taught the Indians, and as soon as one became proficient, he in turn communicated his knowledge to the others. By so doing there was spread among the people the greatest amount of learning in the shortest space of time. The Indians, like the Chinese, were apt in imitation. They picked up the trades easily, and were flattered into perfect workmanship by becoming so soon the instructors of their fellows.

This time has been called "the Golden Age of California." Then everyone was happy because everyone was busy, and yet no one was overworked. Labor began usually at 5 A. M. after the morning angelus and breakfast. Rest, coming at 11 A. M., when the noon meal was served, continued until 2 P. M. Everyone was allowed complete relaxation during this period. From 2 to 5 work was resumed, then supper, often eaten in the open air, and after the evening angelus there was time for recreation, for dancing and games, until 7.30 P. M., when all retired within the mission to peaceful and well-protected slumbers.

SANTA YNEZ MISSION.

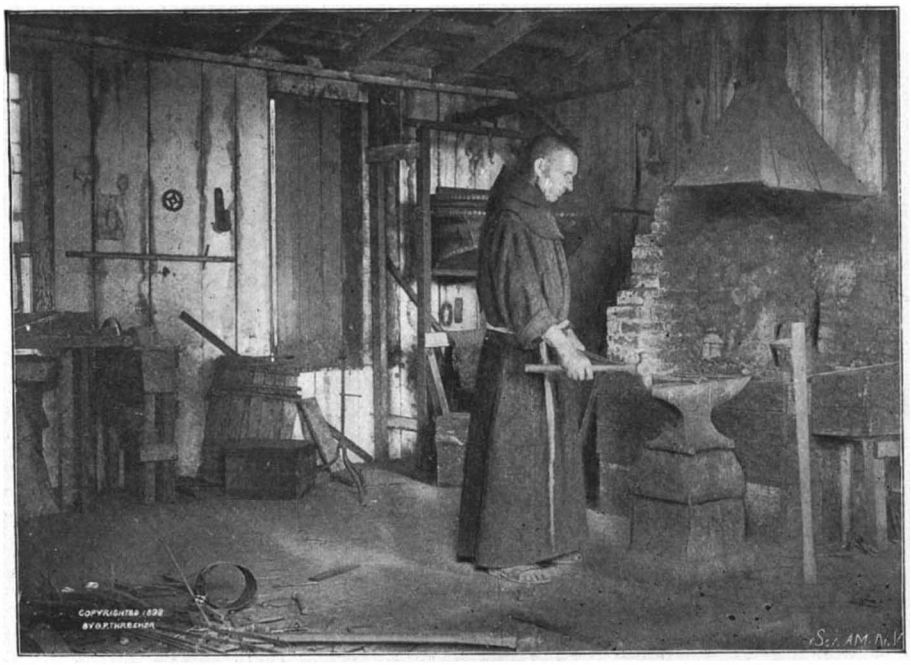
The mission buildings themselves constituted the whole city. They were the fortress, the church, the state, the school, and the seat of all industrial learning and technical training. They were built in a rectangular form inclosing a square, or *cuardo*, which furnished an impregnable fortress in time of war and gave ample space for community gatherings.

Much of the work of the earlier periods was done within the *cuardo*, or great square court of the mission, where the workman and his tools could be safe from theft and invasion. Later there were houses built for the trades people and their work on the outside. The ruins of these are still remaining in some places—ruined gristmills and old tanneries, which are picturesque features of these ancient times and furnish additional pages to the history of the occupations of the age.

Each mission was expected to be able not only to carry on all trades, but also to manufacture the tools with which that trade was carried on. To a certain extent tools were brought from Spain and from Mexico, yet in the main the missions were self-sustaining and provided every article for their own consumption and use. They were, moreover, specially renowned for certain trades and famous for certain articles manufactured.

From well-authenticated records San Fernando Mission comes down to us as being especially skillful in handling iron. Before the flaming forge the men of this mission stood day by day and made the anvil ring and the sparks fly. They taught the Indians to make chains; and so expert did their pupils become, that it was impossible to tell which was the original and which the copied article.

From their shops were turned the clever bear-traps that enabled them to protect the mission herds from all wild beasts. Hammers, pulleys, flatirons, scissors, plowshares, scales for measuring gold and scales for measuring rations—all of these and many more are now remaining in well-preserved relics. The friars of this mission were most adroit in the making of nails.



BLACKSMITH—OLD SPANISH MISSION.

SANTA BARBARA MISSION TAILORS.

RUIN OF AN OLD TANNERY.

A FRIAR GARDENER AT WORK.

These, while made by hand, were cleverly turned, pointed at the end very much more than are the nails now made, and fixed with a sort of hook-like point, so as to enable them to clinch more securely than they would if blunt. It was necessary that the nails that held their great wooden double doors together should be well made and durable.

An old cowbell is still on exhibition, which possesses a singularly sweet quality of tone. At evening time this musical monitor led the herds home and sounded well to the ears of the expectant herdsman. In the same collection are found also iron bands that held the hubs intact for those great clumsy vehicles used as wagons. These vehicles were called *carreta*. Bits of almost all tools that are still used are to be seen there also in the famous collection made by Don Antonio Coronel, of the city of Los Angeles, and which is now located in the Chamber of Commerce.

Notwithstanding the lack of proper implements for working iron, and in spite of poor facilities for getting perfectly gaged heat and other requirements, the workmanship in these is excellent. It is done as well as that of our modern iron workers. One who visited the collection recently said: "This iron is as good as any workman in my shop can turn out now."

San Fernando was famous also for the inlaying of iron with silver, which was used largely in the decoration of bits and bridles. The effect of these shining turnouts upon a prancing horse, tossing his head, and with every movement sending out streams of light, can be imagined when, on the feast days and celebrations, hundreds of gayly-dressed caballeros and senoritas were gathered for a good time and display.

The form of decoration which was used on the bridles was that of the *concha*, or shell. This was used sometimes also on the saddles, though quite as frequently these were almost covered with Mexican dollars, never American. The places that were not so covered were many times beautifully carved in leather. Santa Ynez Mission was famous for the making of these fine saddles and for the most beautiful work in the preparation of the leather as well as for its decoration in clever hand carving. Among the descendants of old Spanish families now living in Southern California there are a number who still retain possession of some of these old saddles and some of the old leather work also. Upon these there is a valuation placed that exceeds that of any similar work now done, however excellent that work may be.

Special aptitude and individual talent made these two missions famous for iron and saddlery; but soil and climate, undoubtedly, had more effect in producing the excellence of wine manufactured in San Gabriel. Tons and tons of vintage were yearly turned out from this famous wine-growing section. It is still giving a goodly yield, with fertile valleys, vineyard-covered, stretching away for miles in the yellow sunshine. As San Fernando was in the closest proximity, there is also the same reason for the success of that mission in brandy making, or *aguardiente*, literally fire-water, as it was then called.

The Indians were especially interested in their work for the church and in houses to be occupied by the padres. They loved the fathers with all the reverence of their childlike natures, and devoted the utmost affection to the service they gave them.

They felled the great trees on the mountains about and brought them down as rafters for the missions and other buildings. The trade of stone cutting also was easily taken up by them, from their familiarity with the making of stone implements used in earlier times. No service was too great, no stone too heavy for them to carry, in the beloved labor.

In the churches are still some remarkable relics of fresco work done by them, which possesses considerable delicacy and beauty. Their wood carving for benches, confessionals, pulpits and chairs is beautiful. There is still one handsome old hand-carved chair in San Diego, one in San Juan Capistrano, and another at San Gabriel Mission.

The trade of the coppersmith was not unknown to them. The copper bowls which they made were finished with handsome decorations around the tops in *repoussé*, and were used on the altars and in the niches of the churches for holy water. Cement work done in the mission buildings themselves is of such remarkable character as to outwear even the stone which it holds in place. It is harder than flint at the end of more than one hundred and thirty years. Nor should the work of the Indian women be omitted. They became, under the guidance of the weavers and menders of the mission, very skillful in this work. They were also easily led from the art of basketry to that of Mexican drawn work. In this they gave ample scope to that peculiar form of imagination which is shown in the kindred art of their former years. With what patience did they work upon the beautiful pieces in pure white linen for the altar cloths and holy habiliments of the church and ministry!

San Antonio was justly celebrated for the manufacture of flour, San Luis Obispo for tiles, and San Solano, the farthest north of all the missions, for feather work. Every trade seems to have received a proper degree of attention, although some in certain kinds of work excelled all others. This success gave an impetus to the work of that institution and brought it into favor with the home country.

Notwithstanding all, there came a time when the friars were to be recalled. The secularization of the missions withdrew the Franciscans to Mexico; and now by a curious similitude the fate of the exiles from California is reversed, and those in Mexico are again exiled to California. They are returning and establishing schools in Los Angeles, at San Gabriel, and other places.

At the time of the first secularization all of the California missions responded to the call and abandoned the mission buildings, except Santa Barbara. There throughout the whole time the regular service has been maintained. Every morning and every evening such distinct ritual orders were observed as to keep up the form of the Franciscan mission work.

And there, at the present day, the faithful friar gardener still attends the flowers, fruits and vegetables, still turns the fertile soil with his miniature plow, and gathers the fruits of his labor at the time of the harvest. The members of this order are the most faithful adherents of the ministry of physical work; labor to them is a part of religion. They do not, however, at present abjure every form of comfort in life and walk about without shoes. In personal appearance they are not even recognized hardly as priests among the people of the thoroughfare, for they dress in citizens' clothing when abroad, on most occasions.

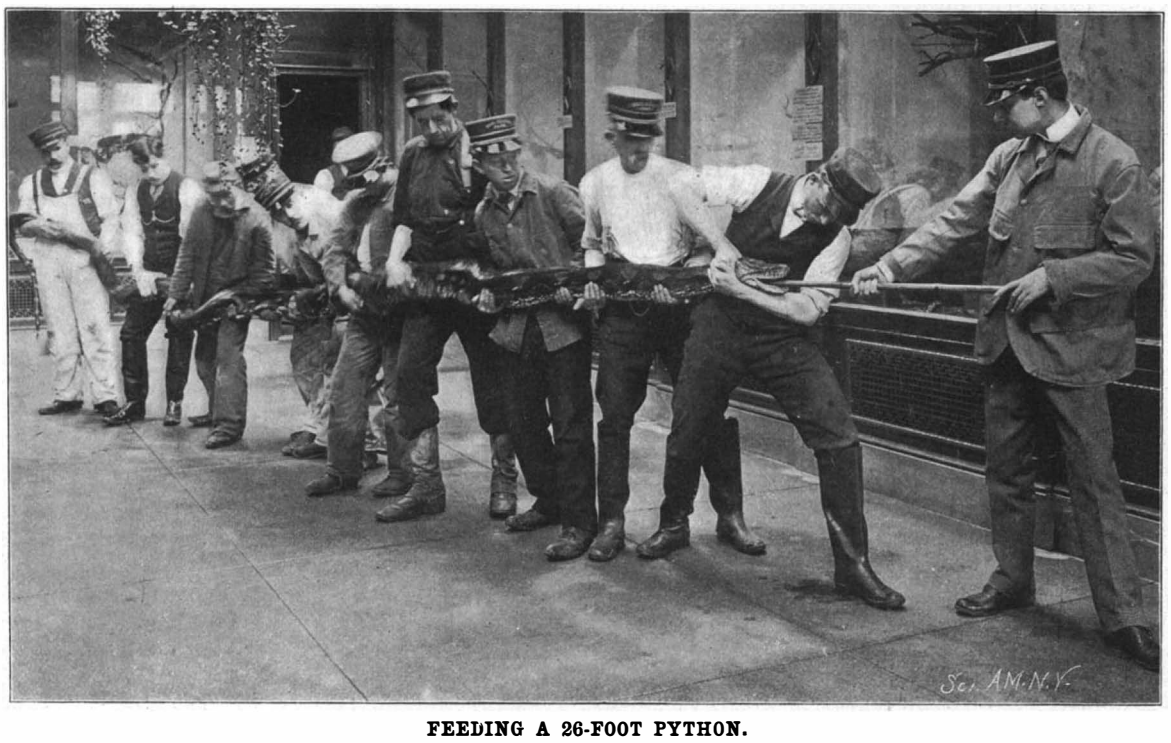
At the missions, though, in regulation robe and cord they work at their trades. The shoemaker sits at his bench with tools and leather and patiently patches, cuts out, and sews on the work before him. In the tailor shops priests are engaged in cutting, fitting and pressing garments worn by the order. They are, however, aided in this day by the sewing machine, with which the old-time mission tailors were not assisted. At the forge still stands the priest blacksmith, just as he did more than one hundred years long gone. The bellows respond as promptly to his touch, the anvil rings out as clear, and the sparks fly up just as they did for his illustrious predecessors. Time has not materially changed the situation. The ruddy flame lights up a face with dress and gown almost identical with the past.

SHOEMAKER OF THE FRANCISCAN ORDER WORKING AT HIS TRADE.

Soon after a passenger train from Otley to Leeds had left the former station, the engine collapsed and brought the train to a standstill, says the Mechanical Engineer. An enormous rush of steam, after the train had traveled about a quarter of a mile, caused the driver to discover that something was wrong. He immediately applied the brakes, and brought the train up in about 100 yards. It was then found that the connecting rod had smashed, and penetrated the under part of the boiler, ripping it open. At the time of the accident the engine was traveling reversed. Had it been going the ordinary way, in all probability the engineman and fireman would have been very seriously injured. As it was, the former was seriously scalded about the legs.

FEEDING A 26-FOOT PYTHON.

There are twenty-five genera of the boa family, the most important of which are the two species known as the pythons. They are of great size, some of them attaining a length of 30 feet, and are noted, usually, for their voracious appetite, but occasionally this appetite fails and drastic measures must be employed. Some time ago the New York Zoological Society secured a 26-foot python, which was placed in the reptile house. It absolutely refused to eat anything, and while it is possible for a snake to refrain from food for a considerable period there is an end even to the endurance of a snake. As there seemed to be no inclination on the part of the snake to save itself from starvation, the authorities decided that extreme measures must be taken. The food, which consisted of two rabbits and four guinea pigs, was prepared. The animals were fastened to the end of a long pole. The snake was firmly grasped by twelve men and brought out in the center of the reptile house. Its mouth was opened and the food was pushed into it by the aid of the pole. The snake made violent efforts to break away, and it was only by the combined efforts of the men that he was held quiet enough to allow the gastronomical operation to be performed. He was then put back into the cage to allow the processes of digestion to resume.

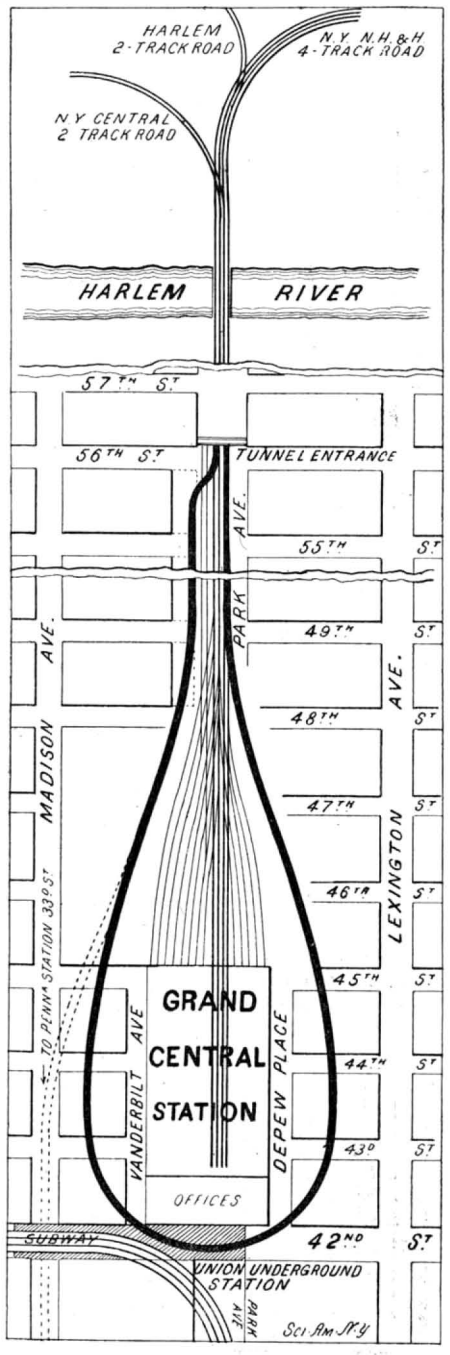


FEEDING A 26-FOOT PYTHON.

A scheme is on foot to provide an elevated railroad for St. Louis.

PROPOSED SOLUTION OF THE NEW YORK CENTRAL TERMINAL PROBLEM.

If the various railroad and transportation companies that enter, or operate in New York city have read correctly the lessons of the past, they must be convinced by this time, that as a rule, previous improvements in transportation have been planned upon too small a scale; that they have not made adequate provision for the extraordinary rate of increase of population and travel in this rapidly-growing metropolis of the Western Hemisphere. Every new avenue of travel that has been opened during the past few years; every improved schedule of train service, has at once attracted to itself a volume of traffic which, unfortunately, has afforded no corresponding relief on other lines of transportation. We see in this an indication that the existing roads were already overcrowded, and that the needs of the city have always been greatly in advance of the facilities to accommodate them. We have no doubt whatever that, when the four-track tunnel was constructed beneath Park Avenue, its builders were satisfied that they were making the most ample provision for all future increase of



PLAN OF THE PROPOSED UNDERGROUND LOOP AT THE GRAND CENTRAL STATION.

travel; yet it is a fact that for many years these four tracks have been altogether inadequate to provide, with due regard for the safety of the public. for the greatly increased number of trains that have been using them.

Our readers will remember that some months ago the Scientific American suggested that the most effective plan for relieving the congestion in the 42d Street station and yard would be to build a terminal loop at 42d Street and separate entirely the local and the express trains, retaining the present yard and train shed for express service, and utilizing the loop for the local service. We pointed out at the time that much of the congestion and delay, both in the tunnel and in the yard, was due to the complicated switching work which was necessary, at the 42d Street yard, in uncoupling and making up again the local trains at the end of every round trip. We showed that by reserving the inside express tracks for the through trains, and utilizing the outside tunnel tracks and the proposed loop for the local service, local trains could be made up at such places as New Rochelle, South Norwalk, Yonkers, White Plains, etc., and could be run into New York, round the loop, and back to their respective starting places, without uncoupling a car or changing an engine.

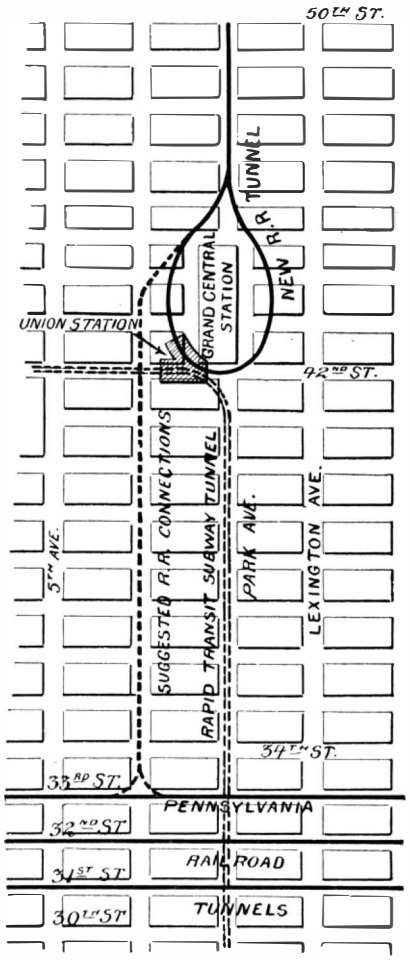
The Park Avenue tunnel and the Grand Central Depot are to-day serving a far more extensive system of railroads than was contemplated at the time the tunnel and the railroad terminal were built. Constructed originally for the service of the Harlem Railroad only, the tunnel is now doing duty in addition for two of the greatest trunk lines in the country, the traffic of either of which, by itself, would find the accommodation of a four-track road none too ample for its needs. By reference to the accompanying diagram, it will be seen that the contributory systems consist of a four-track road, the New York, New Haven & Hartford, which is joined at Mount Vernon by the two-track system of the Harlem Railroad, and is further augmented at Mott Haven Junction by the traffic from the great three-track system of the New York Central & Hudson River Railroad, a system which beyond Albany is, itself, a four-track road. In view of the importance and volume of the traffic which thus accumulates for transit through the tunnel, the wonder of it all is not that this calamitous accident has happened, but rather that such accidents have not been more frequent.

Following closely upon a meeting of the Directors of the New York Central Company, an official statement has been issued to the press, giving a general outline of the plan by which the company proposes to solve both the tunnel and the terminal problem. Briefly stated, the plans contemplate the widening of the area occupied by the present yards and terminals by the purchase of adjoining real estate; the abolishing of steam locomotives from the outside local tracks of the Park Avenue tunnel; the widening of the open cut south of the tunnel from 56th Street and the construction of new tracks therein; the operation of the local suburban trains by electric traction; the construction of a terminal underground loop station at 42d Street, which, with the side tracks in the tunnel, will be devoted exclusively to suburban traffic. The Directors state that the plan as thus outlined was determined upon some time ago by the company, and that the preliminary purchases of real estate were under way at the time the late tunnel accident occurred. It is understood that the company has already purchased a strip 75 feet in width on the westerly end of all the blocks lying west of Park Avenue between 49th Street and 56th Street, and the published statement says that the company will ask from the Legislature for a change of the location of Park Avenue to the westward so as to obtain the use of the avenue, south of the tunnel, for the tracks of the station yard. From this it is inferred that the purchase of the 75-foot strip of land referred to has in view the shifting of Park Avenue bodily to the westward and the enlargement of the width of the approach to the station yard to take in the full width of the avenue. It is understood that the New York Central Company has bought up the blocks lying east of the station yard between 45th and 42d Street and Lexington Avenue. The company also owns most of the property lying between 42d Street and 45th Street and Vanderbilt and Madison Avenues, and as they ask permission to construct a tunnel underneath portions of 43d, 44th, and 45th Streets, and Park, Vanderbilt and Depew Avenues, it will be seen that the location of the proposed tunnel loop may be determined with considerable accuracy. The side tracks, which are to be operated electrically, will commence to be depressed as soon as they leave the tunnel at 56th Street and will run down on an easy grade to the underground terminal loop.

An interesting fact brought out in the statement of the company, which is not generally known to the public, is that when permission was originally given for the construction of the Park Avenue tunnel, it was expressly specified that only steam traction was to be used for operating the trains that passed through it. This stipulation was made so as to prohibit the use of horse or any other animal traction; a fact which is a curious commentary upon the conditions, or supposed possible conditions, of railroading in that earlier day. As matters stand, it would seem that the railroad company has at present no choice in the matter of using steam locomotives between Mott Haven and its 42d Street terminus.

The use of electric traction will not only relieve the tunnel of much of the smoke and steam which undoubtedly have served to obscure the signals in times past, but it will greatly increase the comfort of suburban travel, and will enable the three roads that run into 42d Street to greatly increase their train service. Not only so, but the construction of the loop terminal will bring these trains at 42d Street into close proximity to the trains of the Rapid Transit road, which is now being constructed up Park Avenue and through 42d Street, the line curving around at the intersection of these two thoroughfares, as shown in the accompanying diagram. The 42d Street underground station of the Rapid Transit road is to be located at Vanderbilt Avenue, and therefore in close proximity to the underground station of the New York Central Company. Evidently there is here presented a great opportunity for the construction of a grand union underground station, by which the passengers may pass from the suburban to the Rapid Transit train with the least possible delay. Moreover, since the gage of the tracks is the same on both systems, it would be a simple matter to put in connecting tracks that would enable Rapid Transit cars to be run from Brooklyn or the Battery out to Yonkers, White Plains, or New Rochelle without a change. As a matter of fact the Rapid Transit Commissioners made proposals some time ago to the New York Central Company with a view to co-operation somewhat on these lines; but the latter company refused to entertain the suggestion. Of course, it would be impossible for the New York Central and New Haven cars to enter the rather restricted limits of the Rapid Transit tunnel, but there would be no obstacle to running the Rapid Transit cars out onto the suburban roads.

Taken in connection with the proposal of the Pennsylvania Railroad Company to build a series of tunnels beneath Manhattan Island to connect New Jersey roads with Manhattan and with Long Island, the New York Central tunnel would offer excellent advantages for the running of through trains between points on the Pennsylvania and the New York Central and New Haven systems. The necessary connections could readily be effected by building a tunnel from the westerly side of the loop beneath the Grand Central Station to Madison Avenue and down Madison Avenue



PLAN SHOWING SUGGESTED CONNECTION OF THE NEW YORK CENTRAL AND PENNSYLVANIA TUNNEL ROADS.

to connect with the 31st Street tunnel of the Pennsylvania Railroad. By the construction of a Y at 31st Street, it would be possible to run New York Central trains either to the west to New Jersey or to the east to Long Island. If the New York Central Company were disposed to construct a yard on Long Island for the storage of cars and trains, they would save several miles in distance and much time that is now consumed in running empty trains through the Park Avenue tunnel between the Mott Haven yards and the 42d Street station.

A Newspaper Obituary.

The following announcement was received by us in our mail a few days ago, with the information that the Poulan Herald would be obliged to discontinue. The note read as follows: "In Loving Memory of the Poulan Herald. Born October 19, 1895. Died January 5, 1902.

The Good Die Young.

The clanking press, the clicking type
Are still as still can be;
Our shooting-stick hangs with our harp
Upon the willow-tree."

The Swedish government is considering the feasibility of working all its railways by electric traction in lieu of steam. This should prove an easy matter to accomplish, owing to the abundance of waterfalls throughout the country, to supply the necessary power for generating the electricity. Such a system would prove far cheaper than the present steam traction.

Patent Department

Device for Preventing Shipwrecks.

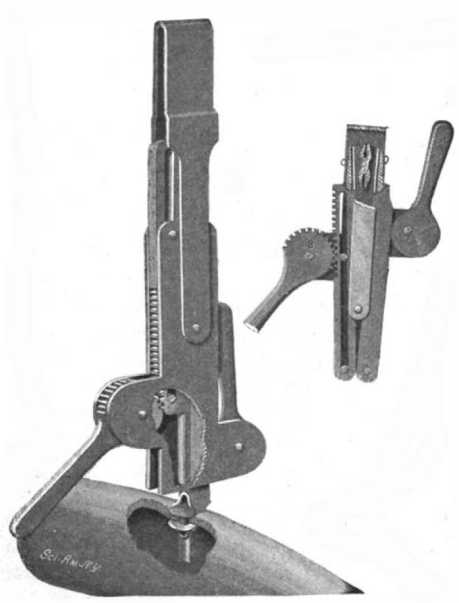
During the last few years many vessels navigating the waters along the coast of British Columbia and Alaska have been wrecked. The American consul at Vancouver remarks in a recent report that he has heard complaints from mariners of the bad lighting of the coast north of Vancouver. It likewise appears that the waters to the northward have not been sounded as fully as the safety of vessels requires. In order to provide mariners with some means of safety it would seem that a device has recently been invented which will minimize the danger hitherto encountered. This is an automatic system of signaling which will warn ships of their approach to dangerous rocks and coasts in all weathers, when even a flashing light might not be seen and the booming of a foghorn be unheard. A metallic conductor is fixed on an elevation ashore, or a lightship, or reef, or light-house. From this, etheric waves are transmitted over a zone which has a radius of seven miles. All vessels within that area which are fitted with receivers are warned of their proximity to danger, the distance and the point of the compass being registered. At the same time, a bell rings and the receiving instrument records the name of the place that is being approached. The automatic part of the invention consists of steel bearings with a number of teeth which pass over a Morse transmitter. No operators are needed. The instrument or machine works absolutely automatically. In its elementary principles, the system resembles Marconi's method of wireless telegraphy, but in detail the system is essentially different.

TIRE-REPAIRING TOOL.

A tool which is especially adapted for repairing punctured pneumatic tires is the subject of the illustration herewith presented. The credit for the invention of the tool belongs to Benjamin J. Piquet, of Woodbury, N. Y.

The tool comprises a frame composed of two plates formed with ears arranged to lie side by side. Between one pair of ears a handled pinion, *B*, is pivoted; and between the other pair of ears, a handled eccentric is pivoted. The pinion meshes with a rack-bar, which slides longitudinally between the frame plates and which is slotted to receive pins uniting the frame plates. The eccentric is designed to engage in one position a swinging bar, *D*, pivoted between the frame-plates. Both bars, *D* and *C*, are formed with hollowed jaws and cutting edges, so that when their lower ends are brought together a tubular punch is produced. A plug-receiving yoke is pivoted on the frame, and is of such size that the frame can be turned end for end therein.

In operation, the handles of the eccentric and pinion are carried up, whereupon the bar, *D*, is held against



THE TIRE-REPAIRING TOOL IN OPERATION.

movement. The punch formed by the lower end of the two bars is inserted at the puncture to produce a clear, round aperture. The aperture having been made, the tool is drawn from the tire and the frame is turned end for end in the yoke. The pinion is now turned until the jaw of the bar, *C*, is drawn within the frame; and the eccentric is also turned to permit the bar, *D*, to swing out. A double-headed plug, *A*, is then placed in the yoke, as shown in the small view. The bar, *C*, is now run outward and its jaw brought at one side of the plug, and the eccentric is manipulated to force the other jaw against the opposite side of the plug. The plug will now be held between the jaws. By reversing the frame again, the jaws can be introduced into the aperture in the tire. Next the pinion, *B*, is manipulated to draw the bar, *C*, from the tire; and one portion of the two heads of the plug in expanding will engage one with the outer and the other with the inner face of the tire. Upon withdrawing the other jaw the remaining portion of the heads will take a similar position, completely closing the aperture.

A MECHANICAL VEGETABLE-CUTTER.

The accompanying illustration pictures a device for cutting or grating vegetables, which is the invention of Frederick Suellentrop, of Linn, Mo.

The vegetable-cutter comprises an upright carrying at its top a tray open at the front and rear. The upright is attached to a table by means of a clamping

A VEGETABLE-CUTTING MACHINE.

device carried at the bottom of the upright. A disk-like cutter for slicing cabbages, potatoes, or the like is carried on a spindle, having a bearing in an arm on the upright. By means of a crank the spindle is turned, and with it the disk-cutter. The disk is formed with radial slots; and one wall of each slot is turned outward toward the tray to form cutting blades. Another form of disk can be used, provided with openings, the walls of which are extended inward to form grating surfaces, this device being designed for the grating of horseradish, cocoanut, or the like.

The vegetable is held by one hand in the tray and against the disk, the crank being turned by means of the other hand. An inwardly-turned lip prevents the upward movement of the vegetable in the tray. By means of this device vegetables are rapidly prepared for table use.

Milk Flour in Sweden.

In a report to the State Department, Robert S. S. Bergh, United States Consul at Gothenburg, says:

Dr. M. Ekenberg, of Gothenburg, has made a discovery which will be of importance in dairy farming. He claims to have invented an apparatus by which milk can be brought into the form of powder, like flour in appearance, but possessing all the qualities of milk in concentrated form, moisture excepted. It is said that this milk flour is completely soluble in water, and can be used for all purposes for which common milk is employed. The milk flour does not get sour, does not ferment, and in the dry state is not sensitive to changes in the weather. It can be kept and transported in tin cans, barrels, bags, etc. The cost of production Dr. Ekenberg has estimated at about 27 cents per 106 quarts, and he thinks that flour made from skimmed milk can be sold for about 13 cents per pound. At a recent meeting of the Academy of Agriculture, Dr. Ekenberg exhibited samples of the milk flour which received favorable comment. It is considered that the invention will be of the greatest importance for the utilization of skimmed milk, which heretofore has largely been wasted, but in the dry form can be transported all over the country without losing any of its original good qualities.

Another Substitute for India-Rubber.

Substitutes for India-rubber and gutta-percha, fibrous and elastic in nature and uniform in color, are claimed to be attained by a process patented by Mark Sherwin and Hans M. Mathieson, of Cambridge, Mass. Fatty oils in the pure state or fatty oils mixed with various quantities of gums, resins, waxes, asphalts, pitch, tar or kindred substances; sulphur or sulphur chloride; coloring matter; a volatile solvent, such as naphtha, turpentine, carbon bisulphid, are the ingredients used. The fatty oils are mixed with the gums reduced by the solvent; the sulphur chloride is gradually added and then the coloring agent. Sulphur chloride is then again added.

Electric Diet.

A member of the medical faculty of the University of Michigan has discovered that a galvanic current promotes the growth of tissue, or, in other words, increases the amount of flesh. That electricity exerts a beneficial influence upon the growth of plant life has long been known. Perhaps this circumstance suggested the idea of electrically stimulating animals.

Two cages of guinea pigs, six to the cage, were experimented with. The guinea pigs were all exactly the same age. Through one of the cages an electric current was passed day and night. The other cage was in no way electrified. For a stated period the animals in both cases were fed with precisely equal quantities of food of the same quality. The experiment proved that guinea pigs who lived in the electrified cage gained in weight during a measured time 10 per cent more than those in the non-electric cage. If, as a result of these experiments, electricity be applied on a large scale to the fattening of animals used as food, we may some day hear of "electric bacon" or "electric beef," which will command a special price.

A Process of Devulcanizing Vulcanized India-Rubber Scrap.

India-rubber manufacturers have long been seeking a method of removing sulphur from old vulcanized India-rubber. An invention patented in the United States by an Englishman may perhaps point out a means for accomplishing their purpose.

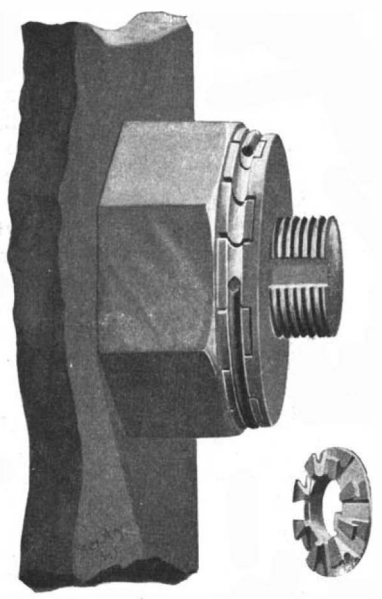
According to this invention the vulcanized rubber is cut up into small pieces and submitted in an iron tank to the action of solvents, such as naphtha, benzol, turpentine spirits, and the like, capable of dissolving sulphur but not of dissolving India-rubber at the heat employed. The tank is heated to a point not exceeding the volatilizing temperature of the respective solvents at the pressure used, and certainly not above 120 deg. F. The bulk of the sulphur contained in the vulcanized rubber is dissolved out into the solvent, while the rubber remains practically unaffected, since the temperature is below the dissolving-point of rubber. After the digesting process has been carried on for several hours the solution is drawn off, distilled and the solvent recovered. If the rubber be not entirely devulcanized a fresh batch of solvent is admitted to the tank.

AN IMPROVED NUT-LOCK

A nut-lock of novel construction which is adapted for secure engagement with a bolt-thread, and which affords means for conveniently releasing the nut from the bolt-thread, has been patented by John H. Ferguson, of Zimmerman, Ohio.

The lock comprises essentially three parts—a nut body, a locking-ring, and a wire keeper-ring. The nut body has ears on one end; and the locking-ring has corresponding ears. When the locking-ring and nut are fitted together, the ears are interlocked. The ears on the nut and on the locking-ring have a peripheral groove, which is designed to receive the spring-wire ring when the nut body and locking-ring are fitted together.

A locking-key within the locking-ring is arranged to

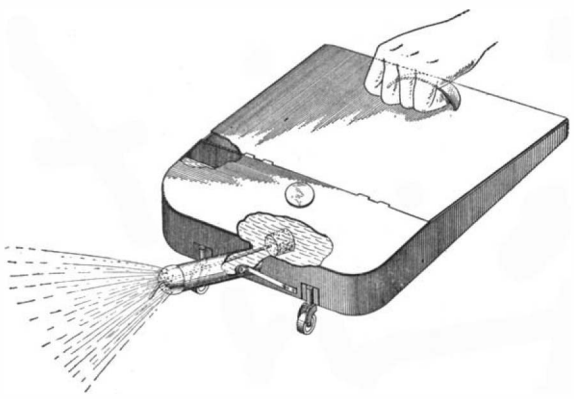


AN IMPROVED NUT-LOCK.

slide in a shallow channel formed in the bolt. When the ring is applied, the interlocked ears of the nut and ring form a continuous wall; and in the groove formed in this wall by the ears, as before mentioned, the spring keeper-ring is inserted to clasp the ears. The nut can be freely screwed upon the bolt when the locking-ring is detached. When the nut is placed where it is to be locked on the bolt, the locking-ring is slipped upon the bolt body and the key entered within its channel. When the ears are fully engaged, the spring-ring is spread by any suitable means so that it may expand to enter the groove.

SOME NEW INTERESTING INVENTIONS.

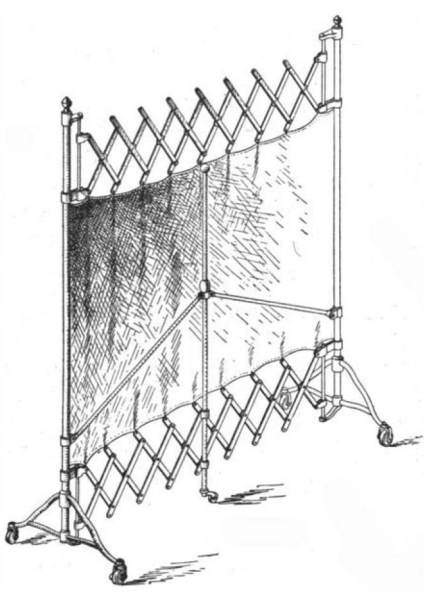
COMBINED DUSTPAN AND SPRINKLER.—A household device which can be alternately used for sprinkling the surface to be cleaned and gathering up the dust after the floor has been sprinkled, is clearly a serviceable invention. The dustpan is provided with a hinged cover to retain the dust when the pan is used as a



A DUSTPAN AND SPRINKLER.

sprinkler. The cover is provided with a hollow finger-grip which serves a double function—as a means for raising the cover, and as a handle for holding the device when it is used as a sprinkler. The dustpan has a transverse partition by which it is divided into two compartments, the one serving as a water receptacle, and the other as a dust receptacle. When employed as a dustpan, the rear portion is held raised by means of castors.

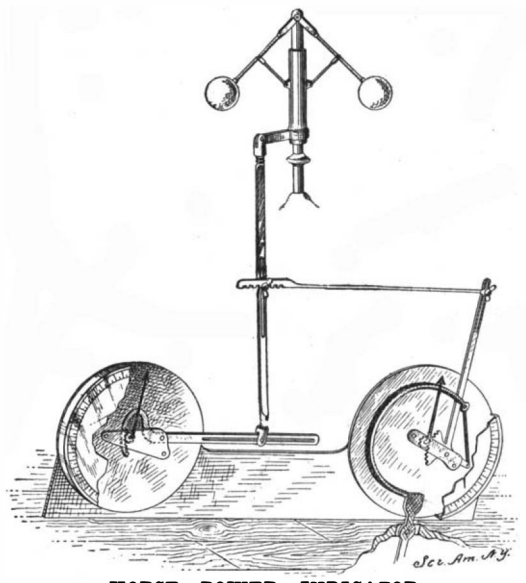
FOLDABLE SCREEN.—A screen that can be folded and packed away and that can be varied in length is the invention of a New Yorker, Mr. Albert Taubert. The end uprights comprising the screen-frame are connected by upper and lower lazy-tongs. A rod is secured to the lower lazy-tongs, and is provided with a slide connected by links with the uprights. When the slide is moved up, the sides of the screen-frame are drawn together; and when the slide is moved down, the screen-frame is extended.



AN EXPANSIBLE SCREEN.

BURGLAR-ALARM.—Most inventors of burglar-alarms are satisfied if they can merely give a signal to indicate that a door or window has been opened. A Kentucky inventor evidently thinks this is too lenient a method, for he has devised a means for moving the floor beneath the burglar and firing a pistol at him. As our picture shows, part of the floor is supported on springs and is provided with vertically foldable supporting standards, which in one position hold the floor in inoperative position. The movable standards are connected with an adjustable rock-bar carrying the pistol. The burglar who enters the house will find the floor mysteriously giving away beneath his feet, and will be rather disagreeably startled to have the pistol discharged at him. The inventor will probably be charitable enough to load the pistol with blank cartridges. The small detailed view shows that the pistol can be thrown down out of operative position.

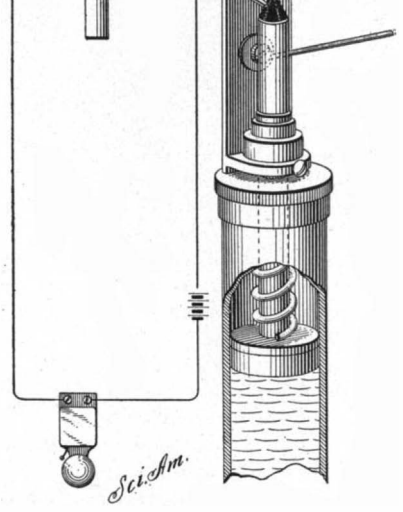
AUTOMATIC ENGINE HORSE POWER INDICATOR.—It is probably a new idea to provide an indicator calibrated for a steam engine of known approximate boiler pressure. Edmund Fortier, of Kankakee, Ill., is the inventor of the indicator. The apparatus comprises a



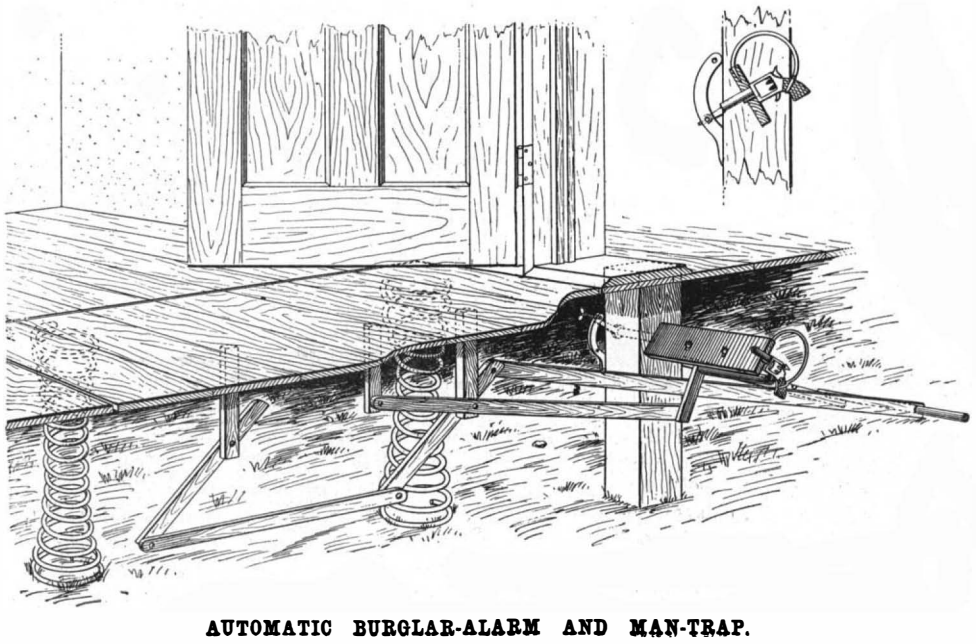
HORSE POWER INDICATOR.

power-indicator dial over which a hand plays operated by gearing carried on a slotted rod which receives a vertical operating rod arranged to reciprocate upon the governor shaft by means of a sleeve. The operating rod likewise controls a pressure-indicator through the medium of a bell-crank lever. A segment gear on the lever meshes with a pinion on the pressure-gage pointer; and an extension on the lever connects it with an expansible Bourdon tube confined within the gage-casing. The indicator is operated to correspond with the fluctuations of the governor, and the leverage between the connecting devices intermediate of the tube is automatically adjusted through the medium of the pressure-gage and its connection therewith. The power delivered by the engine to either side of the normal load is indicated.

THERMOSTATIC FIRE ALARM.—A new form of thermostatic fire alarm has a stem provided with an insulating tapering point and is connected with a conducting bracket. The bracket is wired with one end of a circuit including alarm and conducting wires. A binding-post connected with and insulated from the bracket holds the other end of the conducting wire. A spring-tongue is secured by the binding-post to the bracket and is insulated therefrom, the tongue having its free end normally maintained by its spring action out of contact with the bracket. The tongue is notched to receive the tapering point of the stem. When the thermostat reaches a certain temperature, the stem will be forced up, and its tapering insulated end, coming into contact with the downwardly-projecting tongue, will force the tongue into contact with the bracket, thus closing the circuit and sounding the alarm.



AUTOMATIC FIRE-ALARM.



AUTOMATIC BURGLAR-ALARM AND MAN-TRAP.

Some time ago the English Automobile Club offered a prize of £100 for the best method of preventing the dust raised by motor cars causing annoyance to other users of the roads, says The Engineer. As none of the devices submitted in the prescribed time were satisfactory, the period for the submission of inventions has been extended by the club.

Brief Notes Concerning Patents.

George Westinghouse has applied in the Orange Free State for patents covering his gas manufacturing process. The application will be formally acted upon during February.

David A. Nicoll, of 305 North Street, Baltimore, Md., claims to have discovered the means of making glass soluble. By means of a chemical action he reduces it to a fluid state, when it can be applied with a brush like paint.

Telephones on the Overland Express permit of communication between the cars of the train while in transit, and up to the time that the train is ready to leave the station the passengers have the advantage of connection with the city service.

A patent was recently issued to Lewis B. Clark, track foreman at the Belle Dock Yards of the Consolidated road at New Haven, Conn. He is a civil engineer and has made an instrument for alining and gaging tracks by an ingenious arrangement of mirrors.

M. Goubet, the French submarine boat inventor, is now at work on the designs of a boat to carry two hundred persons, to be used in the Channel service across the straits of Dover. It is expected to make this trip in a half hour without the least inconvenience to the passengers, while with the present type of craft the trip is much longer and almost invariably rough.

Christian Lehman, quite widely known as an inventor of loom machinery and an expert machinist, died on December 19 at his home, No. 1216 Mascher Street, in the very heart of the mill district of Philadelphia. He was born in Baden, Germany, in 1828, and came to this country when a young man, embarking in the knitting machine business, and he was responsible for many great improvements in this line.

The first public use of the Nernst lamp in this country is to be seen at Hartford, Conn., where the Hartford Electric Lighting Company has installed a number of the lamps in the stores of that city. These lamps were on exhibition at the Pan-American Exposition and have been in regular service at the works at East Pittsburg, but other than this the Hartford experiment is their bow to the world.

A new way of charging for telephone service may come into use if the invention recently patented by Thomas Baret, of Sydney, N. S. W., meets with general approval. He proposes to charge for the total length of all the conversations and not for the total number. His meter consists of a clockwork device which is at rest except at such time as a conversation is being held, and then it is at work registering the actual time consumed by the talk. The up-and-down movement of the switch lever throws the clock into action, shuts it off and keeps it wound.

The interference proceedings instituted by the Patent Office some time ago between Charles E. Tripler and Carl Linde to determine, as between these two inventors, who is entitled to priority of invention of the commercial process of liquefying air, have at last been decided in favor of Carl Linde. Masses of testimony were furnished by both sides. Articles published in the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT figured prominently in the evidence against Tripler. It now remains to be seen whether Linde can maintain his claims against other contestants.

An electrical device, it is said, will supplant the "claque" which is maintained in many French theaters to lead the applause. From Europe comes the rather doubtful story that a machine which counterfeits the clapping of hands has been invented by Herr Zimmerman. It consists of inflated leather bags which are scattered around the house in pairs, being hidden in convenient places. These are brought in rapid contact by electrical means, and the sound made is so natural that the difference cannot be detected. The apparatus is controlled from behind the stage. The story, even if not above suspicion, is at least interesting.

Commander Richardson Clover, the naval attaché of the United States Embassy at London, has just returned to this country for a brief sojourn and has brought with him, for the inspection of the Naval Department officials, an invention for controlling torpedoes by wireless telegraphy. This is the invention of an Englishman named Garden, and while the Commander would not go into particulars about the system, he said he thought it had several features not to be found in any of the other methods accomplishing the same purpose. It is said to be possible, not only to steer the torpedo by the means of the etheric waves, but to stop, start and discharge it with perfect accuracy.

Legal Notes.

CONSTRUING CLAIMS.—The doctrine of mechanical equivalents and the theory of the construction of claims received no little attention in a decision recently handed down by Judge Gilbert in the Ninth Circuit of the United States Circuit Court of Appeals. Herman Cramer had brought an action at law against the Singer Manufacturing Company for an infringement on the first claim of his patent for a new sewing-machine treadle. Cramer's broad claim called for a "treadle provided with trunnions," the treadle supports being located in the vertical cross brace connecting the legs or side pieces of the machine. By so locating the treadle a better alignment could be secured, and the tendency of the machine in operation to loosen the joints which hold the legs in position, thereby displacing the treadle, was overcome. It would seem from the evidence submitted that never before had the treadle been mounted in the vertical cross brace. Soon after Cramer had patented his treadle, the Singer Manufacturing Company began to make, under Letters Patent granted to one of its employés, sewing machines in which the treadles were also hung in a vertical cross brace. The patent of the Singer Company provided for the use of point-center instead of knife-edge bearings with trunnions, which are the essential feature of Cramer's patent. The Court found that Cramer was entitled to the broadest application of the doctrine of equivalents, and insisted that if he had been the first to mount his treadle in the vertical cross brace, he was undoubtedly entitled to the protection of that combination and to the exclusive right to mount his treadle in the cross brace, no matter what the form of the bearings of the treadle might be. Furthermore, the Court found that in order to mount the Cramer treadle in the vertical cross brace on knife-edge bearings, it was absolutely necessary that it be provided with trunnions or their equivalent. If the patentee were entitled to the doctrine of mechanical equivalents and to the protection of the right to mount his treadle in the vertical cross brace with bearings, whether knife-edge or point-center, his right certainly "is not affected nor diminished by the use of the words 'provided with trunnions,' as found in his claim."

The Court likewise held that an inventor is not circumscribed by the words which he may first use to describe the merits of his invention, but that he may assert and maintain all the advantages which his device possesses. The point was raised by Cramer's opponents that in his original application Cramer had designated his invention as a "noiseless, self-adjusting treadle," that only by subsequent amendment had he defined his invention as a means "to keep the treadle bearings rigidly in line and at a fixed distance apart, to avoid friction," and that he should be limited to the original purpose specified. By such a limitation the charge of infringement could be avoided. The Court decided that Cramer was not limited to the purpose of securing a noiseless, self-adjusting treadle, but that he was justified in claiming all the advantages which might accrue from the application of his device.

LIBEL SUIT.—Our English contemporary, the Electrical Review, of London, recently won a libel suit in which it was the defendant and in which the right of an editor to criticise the work of an inventor was upheld. The action was brought by Benjamin C. Pole, an engineer, who went to England with a view of exhibiting his "multiple energizing momentum engine," which he christened "Poleforcia," as expressing a power which he claimed could be obtained in excess of the energy to be derived from other machinery used for similar purposes. "This curiously named engine," said the Electrical Review in the alleged libelous article, "consists of a series of engines with ratchet coupling to an assemblage of flywheels; and some wonderful gain of energy is supposed to be secured by the non-positive connection in the performance of rotary foot-pound work. Each flywheel is run nine revolutions idle, and is then automatically coupled to the shaft for three revolutions. The idea of the inventor seems to be that he can derive energy from nothing, because more power is required to lift one ton one foot than to draw one foot horizontally." The plaintiff objected not so much to the criticism of his engine as to the Electrical Review's statement that "it must have cost a lot to print the brochure on very good paper, and there must be some deluded creature at the back finding the money for this ridiculous thing. Presumably the public may be asked to subscribe to this, or we should not have noticed the affair at all. If those in it are acting in ignorance, it is kindness to let them know that the engine is best fitted for the useless scrap heap." Testimony was given for the defendant to show that for 1.4 electrical power put into the plaintiff's contrivance 0.425 came out; that is to say, 70 per cent of the power was lost in the machine. In another test 67 per cent was lost. After considering the matter for twenty minutes the jury returned a verdict for the defendants. The decision may be considered as a victory for that class of technical paper which is ever alert to warn the public against contrivances that are founded upon false scientific principles. Promoters very often sail so closely to the wind that in most cases the damage is irretrievably done when a company is once floated; and although the exposure of misleading claims on the part of promoters becomes the solemn duty of a paper, it is usually a very thankless task.

ENGLISH TRADE LIBELS.—The previously-mentioned unsuccessful suit brought against the London Electrical Review renders particularly timely an interesting article published in Engineering on what constitutes a libel to those who are engaged in the multifarious industries of our time. The nature of a libel upon persons in the way of their trade is well shown by the following case:

A certain paper in commenting upon the installation of a number of type-setting machines in an American newspaper office, remarked that "so short-lived does the installation appear to have been, that we learn that the machines were discontinued. This will be a very serious blow for this machine." It was decided when the case came up on appeal in an action for libel, that these words, besides being a disparagement of the plaintiff's machines, which would not be actionable without proof of special damage, were also, when taken in their reasonable meaning, capable of being understood by men of ordinary intelligence as conveying an imputation upon the plaintiffs in the way of their trade, and the question of libel or no libel was therefore rightly left to the jury. This judgment was affirmed in the House of Lords; and it was there stated that "if the only meaning which can be reasonably attached to a writing is that it is a criticism upon the goods or manufactures of a trader, it cannot be the subject of an action for libel; but an imputation upon a man in the way of his trade is properly the subject of an action without proof of special damage."

The principles upon which the publication of a libel, injuriously affecting the property in trade of a man, may be restrained, apply also in the case of slander. But jurisdiction in such cases is exercised only with the greatest caution. Whenever A accuses B of knowingly and intentionally infringing A's patent or copyright or trade-mark, in order to pass off his goods as A's, B has suffered a personal libel. But merely to state that B's patent is invalid, or that a picture which he sells is a piracy, is no libel on B personally, and is actionable only if the words be published falsely or maliciously, and damage has actually resulted. The same principle applies to cases for what is called slander of title. In the case of Crampton vs. South & Main (58 L. T. 516) it was decided that an action lies against a defendant who issues a circular stating that the plaintiffs' invention "had been proved to be an infringement of his own," when no proceeding had ever been taken to test its validity. The statement was clearly groundless and rested upon no probable cause.

In Hubbeck vs. Wilson (1899, 1. Q. B. 86) the Court of Appeal laid it down that a statement by a trader that goods of his manufacture are superior to those made by a rival, although untrue and made maliciously, is not actionable as a defamatory libel, nor does such a statement afford ground for an action, even if the plaintiff avers special damage. An injunction can, however, be obtained from a Judge of the High Court as a measure of relief. But such an injunction is granted only in the clearest cases.

The wrongful use of a trade-mark is sometimes made the subject of comment on the part of the true owner of the mark. Wherever there is no doubt of the validity of the mark care must be exercised before any accusations relating thereto are made through the medium of advertisements. An example may possibly here be not out of place. In 1897 two trade-marks registered by the Royal Baking Powder Company, of New York, were expunged from the English register of trade-marks by the order of the defendants, Wright, Crossly & Company. Both trade-marks were labels containing prominently the words "Royal Baking Powder." Soon after the defendants issued a circular referring to the order, which circular was alleged by the plaintiffs to be an intimation that they were not entitled to sell baking powder as "Royal Baking Powder" and that the defendants intended to proceed against those who used the label. An action was then commenced by the plaintiff company to restrain the defendants from representing that the plaintiffs were not entitled to sell their "Royal Baking Powder" in the United Kingdom, and from maliciously threatening the customers of the plaintiffs with legal proceedings in respect of their sales of the plaintiffs' baking powder. On the trial it was held that the circular represented what was not true, with regard to the plaintiff's baking powder; was issued, not in good faith in support of a just claim, but maliciously, and had caused special and substantial damage. An injunction was granted, but on appeal (which was affirmed in the House of Lords) it was decided that there being no circumstances to suggest a secondary meaning the circular did not mean that the defendants intended to proceed against persons selling the plaintiffs' baking powder under the name of the "Royal Baking Powder."

It sometimes happens that a firm issues an advertisement to the effect that its product has received the "First Prize Medal" at some exhibition, whereas, in fact, the reward in question has been bestowed upon a trade rival. The question then arises: Can an action be maintained to restrain the publication of such a misleading statement? It would seem that in England there has been no case on the point. The author of the article in Engineering, however, believes that if it could be shown that such a statement was issued maliciously, and with the intention to injure the person who was a true holder of the award, the statement would be libelous, and could be made the subject matter of successful proceedings. It seems to us that an action might well be maintained if it could be shown that by the use of the words "First Prize Medal" trade was actually diverted. In such a case actual damage could certainly be computed.

In Part IV. Special Term of the New York Supreme Court, Judge Leventritt reiterated the broad rule stated in the Prince Manufacturing Company vs. Prince's Metallic Paint Company (135 N. Y., 24) which reads: "Any material misstatement in a label or trade-mark as to the person by whom the article is manufactured, or as to the place where manufactured, or as to the material composing it, or any other material false representation, deprives a party of the right to relief in equity. . . . It is not whether or not the plaintiff intended to deceive, or whether the defendant designed to impose on the public; it is sufficient to forbid equity from interfering if his label was naturally calculated to and did deceive." The plaintiff in a recent case under discussion invoked the aid of the court of conscience, while his own conduct in relation to the subject-matter of the suit, in the language of Judge Leventritt, was unconscionable. It is a most salutary rule, which in cases like the present denies equity to a person who has been guilty of a material misrepresentation on his label, concerning the ingredients composing the article which he seeks to protect.

THE CASCARET CASE.—In the matter of the Sterling Remedy Company against R. J. Gorey, decided in equity in the United States Circuit Court for the Northern District of Ohio, it was held that the word "Cascara" was an infringement of "Cascarets." The box sold by the defendant compared with that introduced by the complainant presented no such dissimilarities as would distinguish the one from the other. The Court found that the defendant so advertised his product and so boxed it that an unfair advantage was taken of the complainant. Although there were differences between the two packages, the differences were less observable than the resemblances; and unless the defendant intended to infringe the rights of the complainant, "he has gone to extraordinary pains in imitating the package of the complainant."

"GRAPE-NUT" TRADE-MARK ACTION.—The Postum Cereal Company, Limited, recently brought an action against the American Health Food Company in the United States Circuit Court, E. D. Wisconsin, for trade-mark infringement, alleging that its mark "Grape Nuts" was infringed by the name "Grain-Hearts," the product of the defendants. The Court found that no infringement existed in fact. The package of the complainant was not so imitated by the defendant as to lead to unfair competition in trade, although there was similarity in the terms in which the foods and the qualities were described. The Court held that the defendant's goods were reasonably distinguished from those of the complainant in the conspicuous trade-mark on the labels, in the coloring and printed matter of the packages and in general appearance, so that the charge of unfair competition in trade was unfounded.

THE CYANIDE PATENTS IN NEW ZEALAND.—It is reported by the Minister of Mines for 1900, in the matter of the cyanide process in New Zealand, that since the patent rights were granted four years ago, the amount of revenue paid to the government has amounted to £4,253, or about 42½ per cent of the initial cost incurred. By recent legislation the term to which the patent rights remain in force in New Zealand has been extended until such time as the revenue derived from gold mines exceeds the expenditure which was necessary to make the cyanide process available to the gold-mining industry of the colony.

RECENTLY PATENTED INVENTIONS.

Bicycles.

STAND FOR BICYCLES.—Frederik C. V. Arp and Sören C. Jensen, Blegdamsvej 8, Copenhagen, Denmark. The cycle-stand is hinged to the front fork and is arranged to be brought down forward of the front wheel so as to support the bicycle when desired and thus enable it to be held in an upright position. When the machine is to be ridden, the stand is folded alongside the front fork.

Railway Appliances.

LOCOMOTIVE-BOILER. — John J. Regan, Jersey City, N. J. The steam-boiler comprises an external shell and an internal shell disposed longitudinally therein and eccentrically thereto, and forming a water and steam compartment surrounding the internal shell. The internal shell is divided into a primary combustion-chamber, an auxiliary combustion-chamber and other chambers which are equipped with independent sets of smoke-flues. As the water circulates in the chambers and around the auxiliary combustion-chamber it is evident that a very quick generation of steam takes place without loss of fuel. Hence the greatest economy in fuel consumption is obtained with an extremely rapid generation of steam.

ELECTRIC SHIFTING DEVICE FOR RAILWAYS.—Henry S. Esch, Manhattan, New York city. The device is designed for use on trolley lines in connection with an improvement for an automatic track-switch whch Mr. Esch has invented. The present invention provides an improved shifting device for moving the switch-point from an open to a closed position, or *vice versa,* whenever successive electric currents are sent to the device, and for causing an approaching car either to continue on the main line or to pass from the main line to a branch line.

RAIL-JOINT.—John C. Furman, Strattanville, Pa. The invention relates to means for coupling together the continuous ends of rails in such a manner as to provide a strong, solid joint, which can be laid either upon the ties and spiked thereto, or placed between the ties without spikes; which strengthens the track and keeps the rails always firm; which entirely dispenses with bolts and nuts; and from which the rails can be easily detached.

SWITCH.—John C. Flint and Maurice S. Dean, Anaconda, Mont. It is a primary purpose of this invention to lengthen the life of a switch-point and to prevent the wheels climbing the switch-point when a switch is located on a curve. The switch has a switch-rail, the point of which extends beyond the ends of the opposite lead-rail; a head-rod for the switch and lead-rails and having an extension for connection with extension point; and a turnbuckle in the extension for lengthening or shortening it.

AUTOMATIC TRACK-SWITCH FOR ELECTRIC RAILWAYS—Henry S. Esch, Manhattan, New York city. This improved switch is completely under the control of the motorman to enable him to run the car in the desired direction. A frame provided with a bow-shaped channel receives a short portion of the trolley wire and maintains a bow-shaped loop therein. A contact-plate is located in the loop in alinement with the general direction of the trolley-wire and insulated therefrom. An electrode connects the contact-plate with electrical mechanism for operating the switch, another electrode being the trolley of the car. The attachment always stands in proper position for engagement by the trolley-wheel without jar or jerk, as the under side of the attachment is in alinement with the trolley-wire. As this underside also conforms to the shape of the groove of the trolley-wheel, the attachment cannot slip over nor the trolley-wheel jump off.

Metallurgical Improvements.

ORE-CONCENTRATOR. — Richard R. Lee, Pinos Altos, New Mexico. A circular pan is provided with a central revolving vertical shaft bearing radial arms which carry scrubbing-brushes that travel upon the bottom of the pan. The trough is made rigid end to end and its inner end is directly hinged to the bowl, so that while it may be lifted out of the way it never becomes clogged at the joint.

APPARATUS FOR TREATING GOLD ORES.—Vincente Pazos y Sacio, Yauli, Tuctu, Peru. The apparatus comprises a receptacle for holding the mercury and the ores; an electrolytic vessel adjacent to the receptacle and communicating therewith; and a porous cup located in the vessel. An annular plug fits tir-tight between the porous cup and the vessel by which it is contained. Separate electrolytic fluids are held in the porous cup and the vessel; and electrodes are located in the cup and the vessel. By means of this apparatus gold is extracted from its ores upon a large scale and the chemicals used are regenerated.

APPARATUS FOR EXTRACTING GOLD AND CONCENTRATING ORES AND METALS.—William F. Heathman, Santa Ana, Cal. The object of the invention is to concentrate ores, metals, and gold-bearing sands of every character, with the result that the product of such concentration may be reduced to a small but valuable compass, that a more marketable product is obtained, and that such metals as are embedded in the rock are saved. The invention is based upon the well-known principle of physics that the times occupied by different bodies or substances in falling through water are dependent upon their relative specific gravities and that a body of greater density will acquire a corresponding velocity.

Printers' Appliances.

GAS-CONDUCTING DEVICE FOR LINOTYPE MELTING-POTS.—George H. Messerole, Brooklyn, New York city. In order to dispense with the use of rubber hose to supply gas to the burner of the melting-pot, the inventor employs metal piping so connected with the melting-pot as not to interfere in the slightest degree with the movement of the pot to and from the mold-wheel.

CASTING-BOX.—Leo Grossman, Brooklyn, New York city. The object of Mr. Grossman is to provide a casting-box arranged to permit the casting of a number of stereotypes at the same time, so that a large number are produced quickly by the same machine. The novel feature of the casting-box is a cylindrical core which engages a number of drags. The cores are connected with the drags in alternation. As the metal is poured into the drags the plates are cast; and when this has been done the cores swing out of their drags and into adjacent ones, additional plates being cast, while the previous recast plates are removed from the top surfaces of the cores.

Traps.

BAIT-GUN.—Oliver J. De Roshey, Iron Mountain, Mich. The gun is intended to kill wolves. The construction is such that a cartridge is placed in the barrel and held in position by means of a breech-block carrying a needle. The trigger mechanism is provided with a bait-holder. The hammer is released practically as soon as the bait is touched.

ANIMAL-TRAP.—Edward Mills, Jacksonville, Ill. The trap is designed to catch animals of any kind. In construction it comprises a cage, a door tending to close, and a peculiarly-arranged device normally holding the door in open position and released by the animal to permit the closure of the door.

Mechanical Devices.

CIGAR-TUCK CRIMPER.—John Haines, Manhattan, New York city. The lighting end of cigars of a certain class and workmanship have been manually crimped or tucked to distinguish them from others, and more effectually to combine the parts at the end to be lighted. This invention is a simple and regularly operated machine which crimps cigars more effectively than by hand, and which also tends to straighten the tucked or crimped section of the cigar during the tucking or crimping process.

DEVICE FOR REMOVING BURRS FROM WOOL.—Leopold Offermann, Lepsic, Germany. The device comprises a burr-removing roller having a series of spaced, toothed rings, between which are arranged bars similar to grate bars and depressed relatively to the teeth at those points where the wool is taken off from a feeding roller. Other portions of the bars adjacent to a barrier are extended beyond the teeth, so as to carry the burrs contained in the wool out of the reach of the teeth and cause them to be retained by the barrier, whereupon they can be removed by a clearer.

Tools and Hardware.

DEVICE FOR FASTENING METAL OR WOODWORK TO STONE.—Thomas E. Hicks, Bronx, New York city. Mr. Hicks has provided means for securely connecting various articles made of wood or metal to stonework. Devices of this class are frequently called "expansion bolts." It has been Mr. Hicks' aim to provide a construction which can be readily applied without any danger of injury to the stone, thus avoiding a drawback found in the employment of the expansion bolts generally used.

CLOTHES-LINE PULLER.—George W. Diepold, Long Island City, Queens, New York city. The pulley comprises a single piece of wire which is run through the longitudinal opening of a cylindrical handle, and the ends twisted together in such a manner as to form a hook and a fork to engage the line. The device enables one quickly to draw the line in or out for hanging or removing clothes.

DREDGING UTENSIL.—Jonathan Dungan, Prospect Park, Pa. The invention relates to a class of utensils employed for dredging all kinds of granular, ground, or powered substances—such as salt, pepper, spices, sugar, flour or the like. The utensil comprises a hollow body having an annular flange on its inner surface. On this flange a perforated inner lid is seated. An outer cap piece is adapted to cover the inner lid. The lid and cap-piece have perforations which can be opened or closed by rotation of the cap-piece. The cap-piece is detachably held on the hollow body. The utensil protects its contents from dust, dampness, and atmospheric impurities, and preserves in full strength spices, salt, or pepper.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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WATER WHEELS. Alcott & Co., Mt. Holly, N. J.

Inquiry No. 1911.—For manufacturers of heating furnaces.

Stencil Machines.—A. J. Bradley, 101 Beekman St. N.Y.

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Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 1913.—For manufacturers of electric motors for attaching to ordinary sewing machine stands.

Glass paper-weights for advertising. Write for prices. Lobmiller Co., Wellsburg, W. Va.

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Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

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Rigs that Run. Hydrocarbon system. Write St. Louis Motor Carriage Co., St. Louis, Mo.

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For sheet metal stampings and novelties try Standard Stamping Co., Seventh and Hudson, Buffalo, N. Y.

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Ten days' trial given on Daus' Tip Top Duplicator. Felix Daus Duplicator Co., 5 Hanover St., N. Y. city.

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Are you looking for anything in bent woodwork? Write Tucker Bicycle Woodwork Co., Urbana, Ohio.

Inquiry No. 1919.—For manufacturers of pressed fiber boxes or telescopes.

When you want everything printed on any particular subject write to U. S. Press Clipping Bureau, 153 La-Salle Street, Chicago.

Inquiry No. 1920.—For manufacturers of envelope-making machines.

Special and Automatic Machines built to drawings on contract. The Garvin Machine Co., 149 Varick, cor. Spring Streets., N. Y.

Inquiry No. 1921.—For manufacturers of acetylene gas outfits for lighting purposes.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 1922.—For manufacturers of calendars or posters for advertising purposes.

Mile a Minute Bicycle Driving Mechanism. Patented Dec. 17, 1901. Patent now for sale, terms reasonable. C. V. Wold, 488 Hicks Street, Brooklyn, N. Y.

Inquiry No. 1923.—For manufacturers of steam turbines.

Designers and builders of automatic and special machines of all kinds. Inventions perfected. The W. A. Wilson Machine Company, Rochester, N. Y.

Inquiry No. 1924.—For manufacturers of cotton-seed oil mill machinery.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 1925.—For makers of canning machinery.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Inquiry No. 1926.—For manufacturers of knitting machinery for stockings.

WANTED—Patent articles of merit to manufacture and place on the market. Will buy or pay royalty. Give full particulars. Address Sidney Folder Co., Sidney, Ohio.

Inquiry No. 1927.—For manufacturers of foot power grinding machinery

PARTNER WANTED.—Will give joint interest in valuable patent for repairing pneumatic tires. Simple and effective. B. J. Piquet, Box 3, Woodbury, Nassau County, Long Island.

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EXPERIMENTAL MACHINE SHOP.—We are not using our shops at present. Well equipped with lathes shaper, woodworking machinery, etc. Will rent use and power very low. Fine place for automobile work. Billings Clapp Co., Boston, Mass.

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Inquiry No. 1945.—For parties manufacturing cloth cheese heads.

Inquiry No. 1946.—For the present address of the makers of the "Button Ram."

Inquiry No. 1947.—For parties engaged in drop forging and stamping sheet steel.

Inquiry No. 1948.—For manufacturers of small boilers and boiler heads 12 inches in diameter.

Inquiry No. 1949.—For manufacturer of telephones suitable for private use.

Inquiry No. 1950.—For dealers in stereopticon slides.

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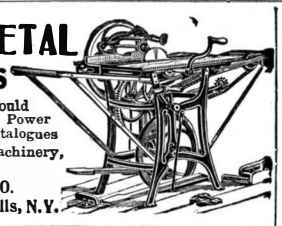

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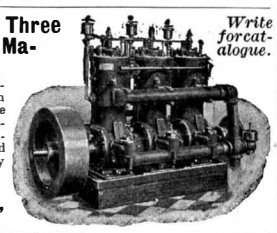

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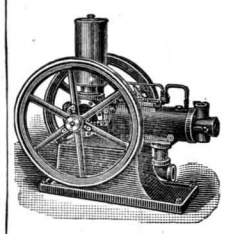

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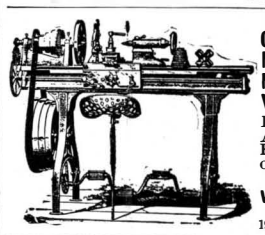

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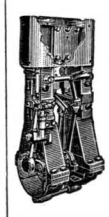

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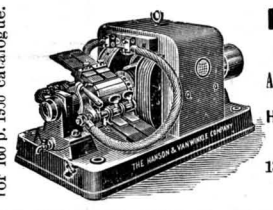

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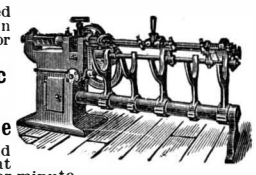

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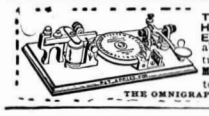

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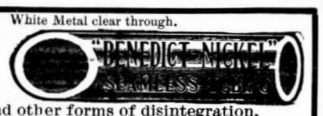

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"Josephine Back, No. 606, Congress Playing Cards," for playing cards., United States Playing Card Co.	448
"Martha Washington Back, No. 606, Congress Playing Cards," for playing cards, United States Playing Card Co	447
"Napoleon Back, No. 606, Congress Playing Cards," for playing cards, United States Playing Card Co.	446

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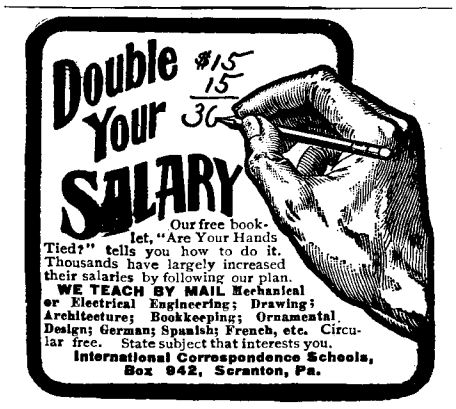

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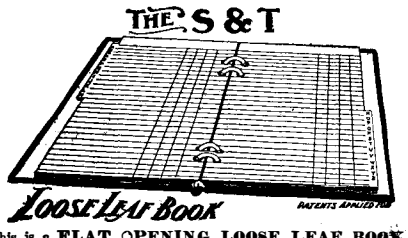

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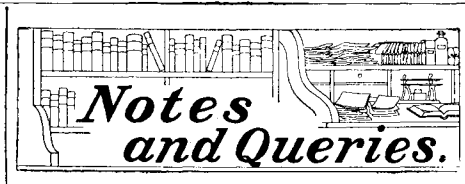

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(8503) An old subscriber says: I have several old daguerreotypes which until recently were in a good state of preservation. Now I find that the surface of the plate has apparently oxidized and the portrait has disappeared from view. Can you give me instructions for restoring the pictures and preserving them? A. The removal of the deposit from the surface of the daguerreotypes is such a delicate operation that, if possible, it should be intrusted to one who has had experience in that process. If, however, you wish to try it yourself, you may proceed as follows: Carefully separate the cover glass from the silver-coated plate, being especially careful that the surface of the latter is not touched even by anything so light as a feather. Soak the daguerreotype first in water, and then in a solution of potassium cyanide, from five to ten grains to the ounce; rocking the dish till the deposit is removed. A 20-grain solution of sodium hyposulphite may be used instead of the cyanide, although it is not always so successful. When the deposit has been removed, the plate should be well washed under a gentle stream from the tap, or in several changes of water, finishing with distilled water. The method of drying is important. The plate, after slight draining, should be taken by a corner by a pair of pliers and held over the flame of a spirit lamp or gas jet, allowing just sufficient heat to evaporate the remaining film of water, the evaporating of which may be assisted by gently blowing across the surface. The restored daguerreotype and cover glass, the latter after thorough cleaning, should then be bound together as before, and the more completely this is done so as to exclude the atmosphere, the longer will the image retain its pristine beauty. Potassium cyanide is a deadly poison. It should be used with care.

(8504) C. S. asks: About how much current does a ¼-inch spark coil take to give full length of spark? A. A good authority gives about 10,000 volts as the pressure required for a spark of ¼ inch. The current, or amperes, is insignificant. 2. Is a relay necessary in wireless telegraphy? A. Yes. 3. Is it necessary to have oscillators on the coil in wireless telegraphy? A. Yes. 4. With good usage how long should an induction coil last? A. Forever. There is no deterioration by use in an induction coil. 5. Can you explain why a Geissler tube still glows when connected with only one wire of the secondary of the coil? A. Because of electrical induction. The waves go through space from one pole of a coil to the other. The Geissler tube held between the two poles of the secondary will glow when it is connected with neither wire. The same experiment can be performed with the bulb of an incandescent lamp. Hold it in the hand by the metal base between the terminals of the coil.

(8505) R. W. W. asks: 1. The object-glass of my telescope consists of two lenses, one being convex and the other concave-convex. When they are together they are the same as an ordinary convex lens. Why is a single one not used? A. The two glasses are used to prevent the objects seen from being bordered with a colored fringe. Remove the concave glass and you will see the difference. Then study in some textbook of physics about achromatic lenses. 2. Why is it that copper wire is used for electric lighting and power currents and iron or steel for telegraph and telephone wires? A. There is a very small flow of current in the telegraph and telephone wires, and a large flow over the lighting and power circuits. Copper is a much better conductor than iron, and though it costs much more in the first place, it is far cheaper in the end. 3. What is the difference between a continuous and an alternating electric current? A. A continuous current flows like a stream of water steadily in one direction. An alternating current flows by rising to its full voltage and then falling to its least. There are alternations of the electromotive force, which has all possible values in a series.

(8506) D. P. asks: Does electricity occupy space? A. No. Electricity is not ordinary matter, as, for example, lead is. Whatever it may be, it is not a material substance.

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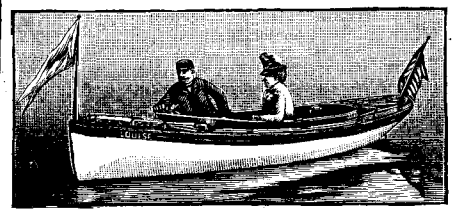

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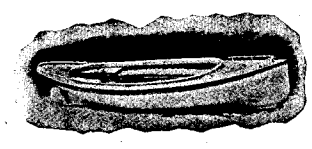

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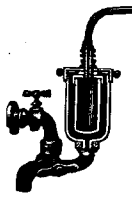

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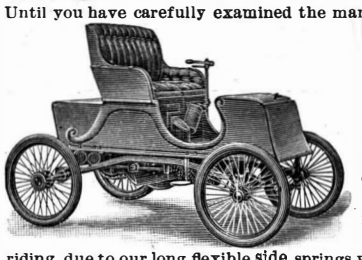

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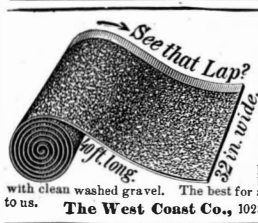

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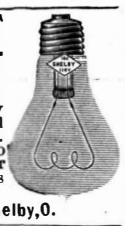

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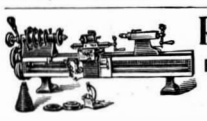

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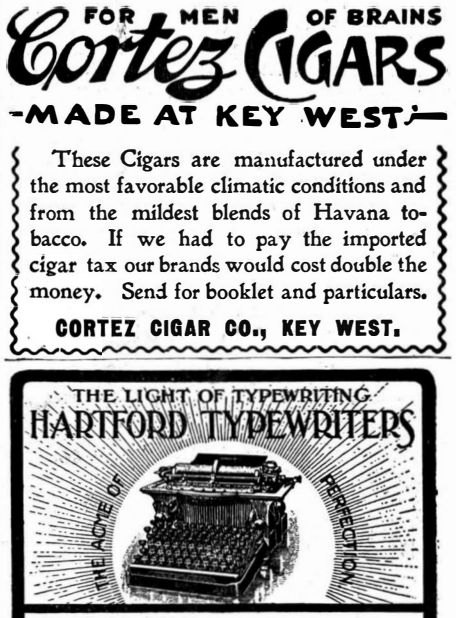

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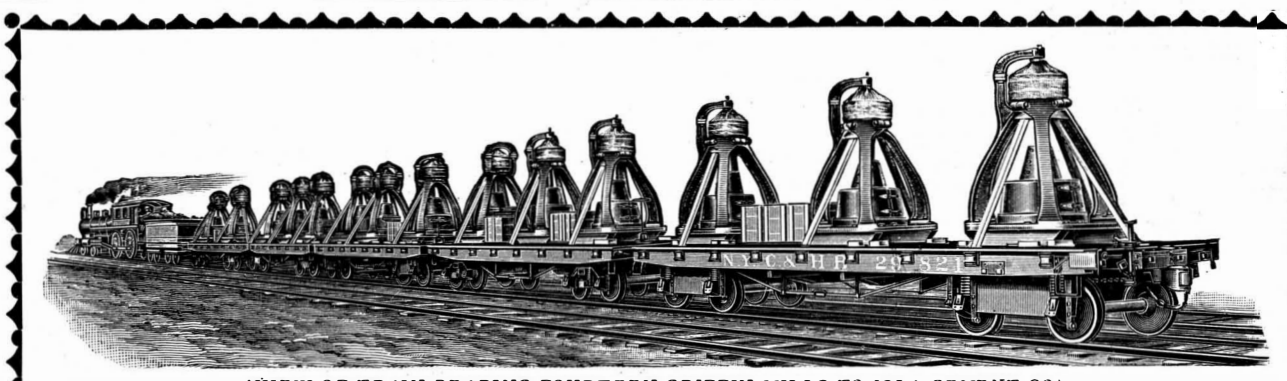

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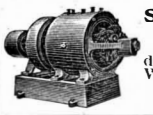

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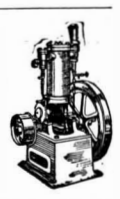

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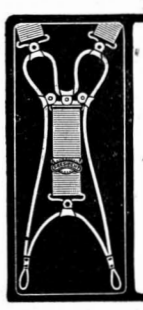

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